



# **PRE AND POST-HARVEST FACTORS INFLUENCING QUALITY OF TABLE GRAPES IN THE EXPORT CHAIN**

**A CASE STUDY OF BAGRAM DISTRICT AND CHARIKAR CITY,  
PARWAN, AFGHANISTAN**

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Master Agricultural Production Chain management specializing in  
Horticulture production chain

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## ABBRIVATION

Afs	Afghani (Afghanistan currency)
AISA	Afghanistan Investment Support Agency
ASAP	Accelerating Sustainable Agriculture Project
BGGA	Bagram Grape Growers Association
CSO	Central Statistics Organization
DAIL	Directorate of Agriculture, Irrigation and Livestock
DAP	Di Ammonium Phosphate
FAO	Food and Agriculture Organization
GGA	Grape Growers Associations
HLP	Horticulture and Livestock Project
IPM	Integrated Pest Management
KFM	Kabul Fruit Market
MAIL	Ministry of Agriculture, Irrigation and Livestock
MT	Metric Ton
NGOs	Non Governmental Organizations
PHDP	Perennial Horticulture Development Program
PPC	Parwan Producers Cooperative
POs	Producer's Organizations
ROP	Roots of Peace
SAB	Solidarity Afghan Belgium
SPSS	Social Package for Statistical Sciences
SWOT	Strengths, Weakness, Opportunities and Threats
USAID	United States Agency for International Development
USDA	United States Development Agency

# TERMINOLOGY

**Afs:** Afghani (Afs) is the currency of Afghanistan and one US Dollar equals to fourty eight Afghani (1 USD = 48 Afs)

**Agriculture practices:** A combination of practices done by the farmer during grape productions such as pruning, lime sulfur, plowing, fertilizing, irrigation and green pruning.

**Clipping:** Removing all injured and damaged berries from the bunch to prepare the bunch for a particular market.

**Cold chain:** Keeping the chilled grapes in a cold place from packaging to the final retail sale, with an ideal temperature of 0°C – 1°C and around 95% relative humidity (RH).

**Cutting/Picking:** Picking and cutting is the same as harvesting and it means to detach bunches off the vine tree.

**Decay:** The stage of decay or fungus development (without powdery mildew) that causes the grape tissue to collapse and determinately influence the value of table grapes.

**Dirty bunches:** Bunches of table grapes that are contaminated with soil or other foreign matters such as dust, sulfur, bird droppings etc.

**Grape variety:** A specific type of grape with particular characteristics such as berry size, shape, taste and color.

**Jerib:** Jerib is the unit to measure land in Afghanistan, and one hectare of land equals to five Jerib (1 ha = 5 jerib).

**Post-harvest handling:** Involves a series of activities/processes that occur from harvest time until reaching the end consumer, it covers harvesting, handling, processing, packaging, storage and transport.

**Pre-harvest practices:** All those agricultural practices that is necessary during grape production.

**Shelf life:** The length of time that table grapes can be stored and remain suitable for consumption. Temperature and storage conditions determine and influence shelf life of grapes.

# ABSTRACT

Grape is one of the major fruit species grown in Afghanistan that accounts for 48% of total fruit growing area of the country. Parwan province is famous for producing fresh and dried fruit like table grapes, raisin, dried apricot, almond and mulberries. Grape is the main crop grown in Parwan province

This study is conducted to 1) discover stages where the quality of table grape is deteriorating during the production chain and 2) to recommend proper pre and post-harvest handling to improve and maintain quality in order to meet the standards of international markets.

In order to achieve the objective of the research; desk studies, surveys, and personal interviews with different actors of table grape chain and other stakeholders were conducted. Survey questionnaire and interview checklists were developed to collect information about pre-harvest practices (agricultural practices), harvesting methods, and quality parameters. Additionally, information about post-harvest handling activities such as sorting, packaging and transportation were also gathered through questionnaires.

After collected data were analyzed, different stages at which the quality of table grapes are deteriorated were identified. Traditional agricultural practices, improper harvesting, and low standard of sorting and packaging were among the causes of low quality grape production. Furthermore, unavailability of cold storages and refrigerated trucks, improper handling and delays in high temperatures during transportation are the stages that contribute to deterioration of quality.

Quality parameters in the international markets are firmness of berries, size, well shaped bunches, color, and being free from decays. The afghan varieties of table grapes have the above mentioned characteristics and quality parameters meet the international standards, and there is demand for them. However, due to various factors, quality is either destroyed before transport to international markets, or the grapes get to international markets with poor quality.

In order to prevent deterioration and improve quality, some recommendations were presented. Empowerment of Producers' Organizations to better represent farmers; proper post-harvest handling, proper sorting and packing that meets international standards by export companies; better transportation and better coordination among POs, supporters, and government entities are highly recommended in order to preserve the quality of table grapes in domestic and international markets.

**Key words:** Table grapes, Quality parameters and export chain

# 1. INTRODUCTION

## 1.1 Background

### 1.1.1 Brief introduction of Afghanistan

Afghanistan is located in South Central Asia with an area of 652,230sq.km. It is a land-locked and mountainous country with an elevation ranging from 1,500 to 7,485m. According to a demographical study of the country 2011, Afghanistan's population is approximately 30 million with a growth rate of 2.37%. Afghanistan has a harsh climate with warm summers and cold winters. During the winter and spring seasons the weather is unpredictable and most of precipitation (rainfall) happens during this time. Months of June through October are considered to be very dry with almost no drop of rain. The country's lower part, which borders Islamic Republic of Iran, has a semi-arid and desert climate with dry, hot and dusty summer. According to Food and Agriculture Organization Statistics (FAOSTAT) 2008, 12 percent of total land area is arable in Afghanistan, but only 6 percent is currently under cultivation.

### 1.1.2 Introduction of Agriculture sector in Afghanistan

Agriculture is the backbone of Afghanistan's economy. Although 12 percent of Afghanistan's total area is arable land, but only around 6 percent is currently under cultivation. More than 80% of the population is involved either directly or indirectly with the agriculture sector.

According to a survey of the horticulture sector by Food and Agriculture Organization (FAO) in 2003, "grape has the highest orchard area and is the major fruit species in more than 15 provinces accounting for 48% of total fruit growing area of the country. However, in most districts of these provinces grapes are not cultivated for commercial purposes". The table below shows that grapes are the main fruit produced in Afghanistan.

**Table 1: Afghanistan fruit production and coverage**

Total fruit production		
Fruit	Production in metric ton	Area in hectare
Peach	24,960	1,920
Almond	42,000	12,000
Pomegranate	96,000	8,000
Apple	77,000	7,000
Grape	864,000	57,600

**Source:** CSO 2008-09

Grape production in Afghanistan is spread all over the country. Kandahar is one of the main grape producing provinces that produces 22% of the total grape production in South Eastern region. Central region, which covers Kabul and Parwan provinces, has the highest production of 31% of total grape production in Afghanistan. In south, grape production is 14%, and finally Herat province in the West produces 9% of the total production (Central Statistics Organization, 2009).

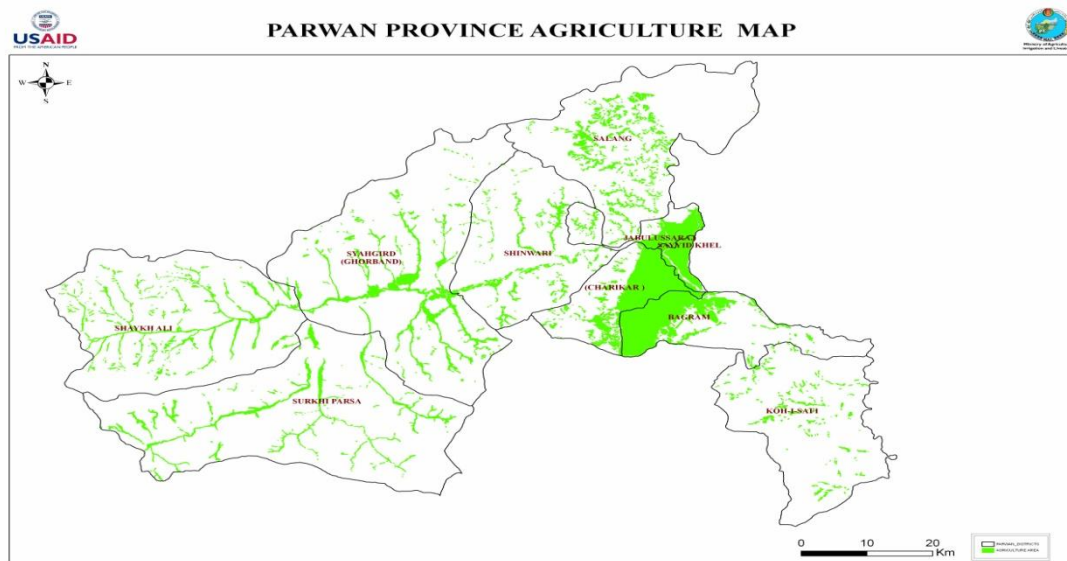
### 1.1.3 Parwan province profile & Agriculture

Parwan province is one of the central provinces of Afghanistan that is located to the north of Kabul. It borders Kabul and Wardak to the south, Baghlan to the north, Bamiyan to the west, Kapisa and Panjshir to the east (USAID, 2008).

Parwan province has around 5700 sq.km of land, which includes 40,680 hectares of agricultural lands. It has the following districts with Charikar being its capital.

- |             |                |              |              |
|-------------|----------------|--------------|--------------|
| 1) Bagram   | 2) Jabul seraj | 3) Shinwari  | 4) Ghorband  |
| 5) Salang   | 6) Surkh Parsa | 7) Saidkhail | 8) Shaikhali |
| 9) Kohisafi |                |              |              |

Parwan province is famous for producing fresh & dried fruits like grapes, raisins, apricot, dried apricot, almond and mulberries. It also produces vegetables like onions, tomato, cucumbers and bean. Cultivation on the same land is rotated between different types of vegetables such as maize, wheat and potato. This diversity of perennial and mixed cropping characterizes Parwan's agricultural sector. Parwan province, for being close, has become one of the major fruit and vegetable suppliers of Kabul city. It also is known as the food basket of Kabul city consumers.



**Figure 1: Provincial agriculture map of Parwan**

**Source:** USAID/ASAP 2008

According to a survey conducted by USAID funded Accelerating Sustainable Agricultural Project (ASAP) in 2008 shows that Parwan province had a total crop production of 320,360 MT, almost 44% of the production was fruits followed by vegetables 26.68% and grains 23.83%, and the remaining 5.86 % was industrial crops.

**Table 2: Commodity production of Parwan Province**

Commodity	Production in MT	Percentage
Fruits	139,803	43.64
Vegetables	85,458	26.68
Grains	76,334	23.83
Fodder & industrial crops	18,765	5.86
Total	320,360	100

**Source:** USAID/ASAP 2008

## **1.2 Problem statement**

Table grapes from Shamali plain are not meeting the quality standards of international markets because less attention is paid to the quality (RoP, 2006). In the first phase of Perennial Horticulture Development Project (PHDP), Solidarity Afghan Belgium (SAB) has worked with grape growers to increase grape production by establishing new orchards, maintaining and recovering old orchards as well as providing technical and extension services. After the first phase of Perennial Horticulture Development Project (PHDP), SAB has started the second phase of PHDP. Under this project, SAB will provide technical and extension supports to Nursery Grower Associations (Sharifi, 2011).

Solidarity Belgium Afghanistan (SAB) has been involved in supporting Afghans for more than 26 years in three main fields; Education, Vocational training and Agriculture. It has been working in different agricultural projects in central regions of Afghanistan. Currently SAB is working on Phase-II of European commission (EC) funded project by the name of Perennial Horticulture Development Program (PHDP). During Phase-I, SAB was able to establish Grape Growers Associations (GGA) in Parwan province, and provided extension services to increase grape production in the region (SAB, 2010).

SAB has worked on improving the production level of the chain, and supported grape growers through Grape Growers Associations. However, grape growers and other actors in the chain complain that quality of table grapes is deteriorating along the chain, and international quality standards are not met that causes to fetch lower prices. Therefore SAB is interested to know the steps and the causes of quality deterioration along the grape production chain in order to improve the quality of table grapes for export market (Sharifi, 2011).

Table grape production and export has increased in recent years due to the introduction of trellised system, increase in growing area and extension services provided by different NGOs. However, Parwan's table grapes do not meet the quality standards of international markets.

## **1.3 Research Objective**

The aim of this research is to explore stages where the quality of grape is deteriorating during the production chain and to recommend proper pre and post-harvest handling methods to improve and maintain the quality of table grapes to meet the standards of international markets.

## **1.4 Research questions**

In order to reach the objective of this research, two main research questions were formulated, and sub-questions are developed for supporting each main question. To answer the main and sub-questions surveys and interviews were conducted.

## 1) How table grapes value chain is organized in Parwan?

- 1.1 Who are the key stakeholders of table grapes chain in Parwan province?
- 1.2 What external factors affect the value chain of grapes?
- 1.3 What are the constraints in grapes export chain?

## 2) What are the current pre-harvest practices and post-harvest methods of handling and its effects on quality of table grapes?

- 2.1 What are the current pre harvest practices of table grapes?
- 2.2 What are the quality parameters of table grapes for buyers?
- 2.3 What are the physical and physiological factors influencing quality of table grapes?
- 2.4 How do you determine harvest time?
- 2.5 What are the post-harvest methods at different level of the chain?
- 2.6 What are the post-harvest losses?

### 1.5. Operational data and sources

**Table 3: Summary of information/ Data and their sources**

Sub Q.	Information/Data	Source
1.1	Structure of the grape chain (Key stakeholders of the chain)	Survey and interview of exporters and cooperative/association directors
1.2	Factors affecting value chain	Field study (survey and interview)
1.3	Problems before and after harvesting	Survey of farmers and interview with exporters and cooperative director
2.1	Production considerations (Pest and disease control, use of fertilizers)	Survey of grape growers
2.2	Quality standards for export market and preference of consumer	Desk study and interview of exporters
2.3	Current quality and factors influencing the quality	Interview with exporters, survey of grape growers
2.4	Determination of harvest time	Survey with the producers
2.5	Pre and Post-harvest practices (producing, harvesting, sorting, packaging, storage, transporting)	Survey with the producers, interview with exporters
2.6	Post-harvest losses (stage, volume, %)	Interview with exporters and survey of grape growers



## 2. LITERATURE REVIEW

### 2.1. Value chain

A value chain from agricultural point of view is a system that links farmers to the needs of consumers while working closely with suppliers and traders to produce the specific goods to meet the demands of the end consumers. An organized and well-developed value chain (figure 2) is important in effective and efficient bringing of products to consumers and thus, benefiting all the actors involved in it (RIU, 2006).

Two types of activities are involved in value chain. First, support activities that consist of activities that do not directly contribute to production. They involve Infrastructure activities such as administration, human resources, technology, purchasing and procurement, and research and development. They are also called supporters of the chain. The second type of activities is primary activities. These activities are direct value creating activities that bring in raw materials, process, produce, package, store, transport and distribute the product to the end consumer and as well as marketing and selling. Different actors are involved in value chain such as suppliers, producers, traders, wholesalers, exporters, retailers and consumers (Porter, 1985).

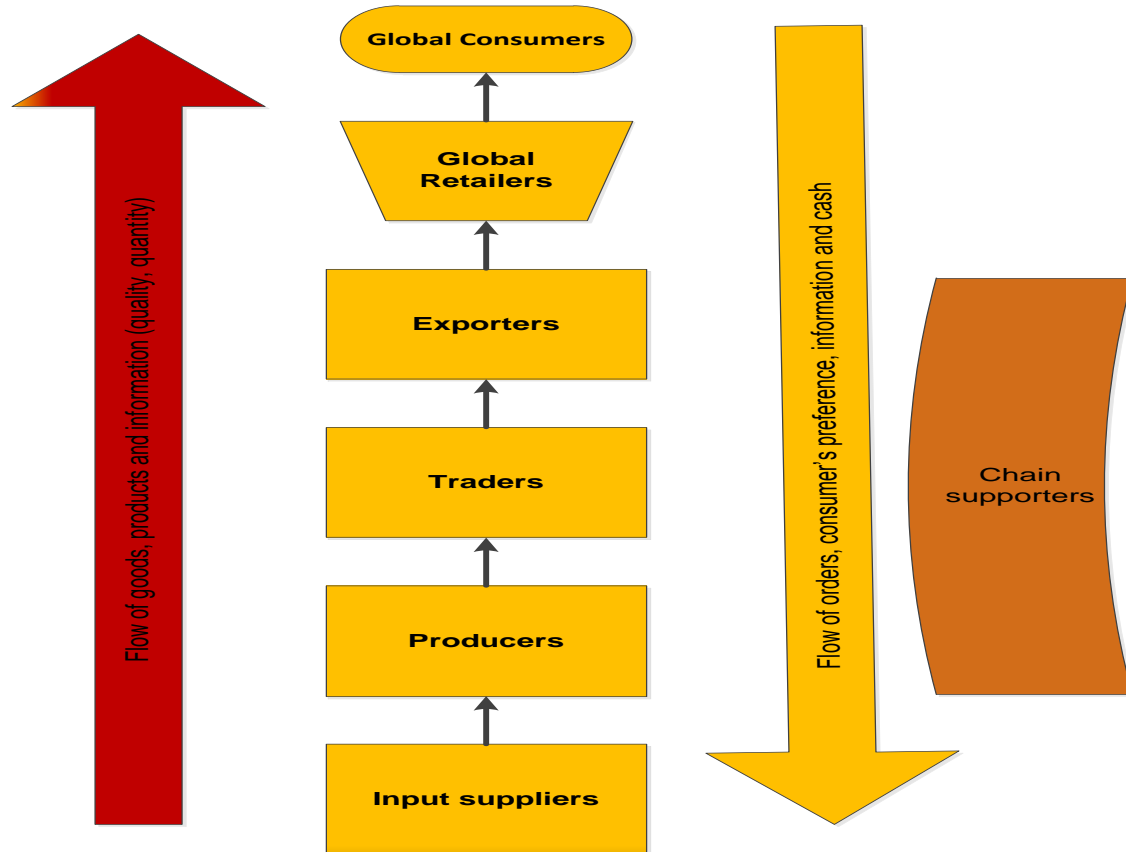


Figure 2: Value chain concept

Source: RIU, 2006

## 2.2. Quality attributes

Quality is defined as the degree of superiority and is an integrated of different attributes, properties or characteristics that add value to each product in terms of its use. The importance of factors of quality relies upon the type of the product and how it is consumed and differentiates among producers, handlers, and consumers.

Producers consider quality as high return and good appearance of the commodity, simple to harvest, and its withstanding long-distance distribution to reach markets. As wholesalers' and retailers' points of view, quality is appearance, firmness and durability of shelf life of the product. Consumers look at quality of fresh fruits or vegetables on the basis of appearance (color, size, shape and freshness) during purchase. Later on purchases depend upon the consumer's satisfaction in terms of flavor and testing quality of the products or produce. (Kader, 2002 and Kader, 2004 cited in Kader, 2006).

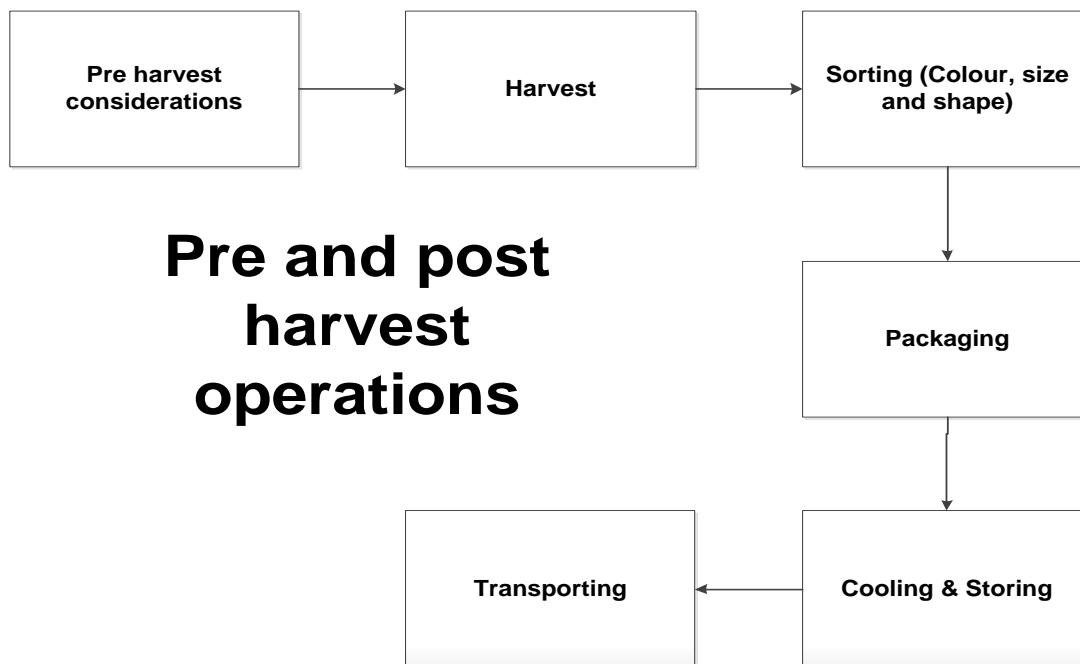
According to Luning and Marcelis 2009 "*Quality is meeting or exceeding customer and consumer expectations*". There are different quality attributes in foods according to consumer point of view like color, texture, size and shape. In order to preserve quality it is important to control physical, chemical, and microbiological damages to the produce. These parts and elements of quality features rely on composition of food processing (sorting) methods, packaging and packaging materials, storage and transport.

Appearance factors of quality are determined by color, size and shape of the fruits or produce. Textural factors are determined by felt with the fingers, tongue or the teeth. Texture of the food vary one from another, but for consumer anything which is going away from the produce expecting by consumer is a quality defect (Parker, R, 2003).

Important factors and preferences for grape consumer's are the firmness of the berry, lack of defects like decays, shriveling, cracked berries, brown stems, sunburn damages and insect damages (Crisosto and Smilanick, n.d.)

Better quality of grape (according to consumer demand) in improved packaging and with better cold chain is considered an important step to enter the international markets. Shelf life is considered as a quality for table grapes. Acceptable table grapes for export market require special knowledge of harvesting, packing, cooling, marketing and logistic process; it also needs intensive labor work in all pre and post harvest processes. Quality grapes should have its firmness, crispy texture, color and flavor. Grapes with no signs of browning on berries, minimum of water loss and dry stalks are also considered quality of the grapes (ROP, 2010).

## 2.3. Pre and post-harvest handling



**Figure 3: Pre and post harvest handling**

**Source:** Roots of Peace, 2010

### 2.3.1. Pre-harvest consideration

Careful pre-harvesting is much more important than handling in later stages in the process. Hence, it is necessary to control diseases such as Botrytis and powdery mildew, which are the biggest threat to the quality of table grape production in the area. Preventing grapes from physical damages like bird and insect damage are very critical to the quality as well (RoP, 2010).

According to Johan 2011, using management practices is not only important after harvesting, but it is necessary to use management practices during grape production when they are on vine tree, and as well as during harvesting. Management practices are needed after harvest in different stages like packaging, cooling, storing, transporting as well as during distribution.

### 2.3.2. Harvesting and packing

Detachment of clusters or bunches from the vine tree at a proper ripeness level is called harvest. Harvesting should be done carefully without any mechanical damage and product loss, as quickly as possible with minimizing the cost. The common method of harvesting grape is hand-harvesting. It has many advantages like avoiding mechanical damages by careful handling during harvest, best selection of fruit clusters in the vineyard in regards to the maturity and appearance, and minimizing capital investment. However, low labor skills and managing pickers are considered the main problems of manual harvesting. To reduce these problems a short training on harvesting as well as on packaging of the fruit according to the market request will be useful for preserving the quality of grapes (Mencarelli and Bellincotro, 2005).

The optimum time for harvesting is when the fruits obtain the acceptable level of consumers' preference, mostly determined by focusing on level of sugar and acidity. Measurement of sugar

level in grapes is done by total soluble solid concentration using a refractometer and sodium hydroxide is used to measure the acidity. Adoption of standard for sugar and acid level varies from country to country, but minimum standard is concentration of 16% of soluble solids for many cultivars (Zoffoli, 2008).

Harvesting and packing table grapes during the hot hours of the day when the temperature goes beyond 30°C is not suitable. In these situation only harvesting in the early morning is advised by holding harvested grapes in a pre cooler or cool room to reduce the field heat. There is a negative impact of high temperature on the quality of table grapes after harvesting like shattering of berries, stem browning and splitting of berries (Johan, 2011).

According to Roots of Peace 2010, presently, little consideration is given to clipping, trimming, cleaning and presenting of table grapes in Afghanistan. Field packing is regular in Afghanistan after harvest at the vineyards; over filling of boxes and crates is also one of the common practices that lead to decay, crushing and splitting of grapes. Financial growth for traders depends on delivering a better quality of grapes to the consumers, therefore, it is necessary not to fill the boxes to the top, no defective grapes should be placed in the bottom of the box, weight of the boxes should be according to the market standards and finally the boxes should be kept in the shade until it is transported.

There are two options to pack table grapes, one in the field immediately after harvesting and the second option is packing in the pack house. The advantages for field packing are 1) to minimize quality deterioration of grapes during transport to the pack house and 2) it requires less investment. Field packing has also two options; one under the vine tree and the second option is in the shade of a small tent. One person is responsible for picking, trimming and packing directly in to the shipping containers for the first option and for the second option the clusters of the grape is picked, trimmed and transported to shade of the tent in trays for packing. The pickers should carefully trim and remove occasional and defected berries, also the pickers should separate the inadequately colored clusters, clusters that are too small, clusters with sunburned, decayed, mildewed (Rosenstock, 2007).

The purpose of post-harvest handling is to sort, pack, store, transport and distribute table grapes effectively and efficiently and to minimize the deterioration of the quality. The market force of supply and demand and on how the quality of grapes satisfies the requirements of the consumer influences the net return (ROP, 2010).

Post-harvest handling is an essential process that links the farmer or product, which is in the field to end consumers who might be thousand kilometers away from the producer. Mainly, post-harvest process starts from harvest and covers sorting, packing, cooling, storing, transporting and distributing (Dept. of Agro-industry, 2011).

According to a report in 2006 by Maheshwar and Chanakya, 30% of the fruits and vegetables grown in India get wasted every year due to poor post-harvest handling. Lack of infrastructure, insufficient cold storage capacity, and poor transportation infrastructure are all the causes of the loss. Developing and implementing an integrated cold chain infrastructure that covers major production areas, processing and distribution units can be counted as a solution to the problem.

Quality standards and consumer preferences are different among different countries and cultures. For instance, quality appearance is more important in developed countries than it is in developing countries. Another distinction between developed and developing countries is the uniformity of quality within a package. Fraud in packaging through placing good quality of

products on top of the box and lower quality products on the bottom of the box is much more common in developing countries than in developed countries. To avoid such frauds in packing, it is important to establish and enforce minimum quality standards. This will improve quality of fruits and vegetables for end consumers, and will eventually build a trust between consumer and supplier in developing countries. (Kader A.A., 2010).

The Afghan kishmishi grapes usual practices is to pack together A,B and C grade quality of grape in a 7kg or 14kg box, with some best quality grapes on the top of the box. On the Indian and Pakistani market, the grapes receive average price of the low quality of the grapes. After auction, the grapes in these two markets are then sorted and categorized according to consumer preferences (RoP, 2010).

### **2.3.3. Storage**

Cooling is one of the critical phases of post-harvest handling of grapes; therefore, it is necessary to eradicate the field heat from the grape fruits after harvest. This helps to reduce the rate of fruit respiration and minimize water loss from the fruit. Temperature is one of the other factors that influence the quality of grapes. Harvested grapes will become worse when the temperature increase, for example the effect of 32<sup>0</sup>C in one hour is more than the effect of 4<sup>0</sup>C in one day and 0<sup>0</sup>C in one week. Therefore, the amount of time between harvesting grape fruits and cooling is important for the end quality of table grapes (Rosenstock, 2007).

Water loss is one of the main changes that occur during storage. The effects of this water loss can be visible like browning of stem. When the loss of water reaches 3-5% fruit berries lose turgidity and firmness. Normally 0<sup>0</sup>C with relative humidity of 95% can be an ideal temperature for grapes. Regular air circulation is necessary in the cold store to minimize the water loss of the stems. Building a cold storage with high standards needs high investment which is beyond the capacity in the developing countries, the main purpose of cold storage is to reduce and keep the temperature low with high (95%) relative humidity. There are simple techniques with low cost to reduce heat from the grapes, like putting grapes or other fruits in an environment which is constructed by straw or bricks, then the wall are wetted to cool down the inside temperature of the construction (Mencarelli and Bellincotro, 2005).

One of the main environmental factors that influence the quality of harvested fruits is temperature, for instance if the temperature increases 10<sup>0</sup>C over the optimum rate, there will be an increase of three fold on deterioration of quality. Quality deterioration of fruits like losing water, appearance, textural quality and nutritional quality is as a result of placing fruits to undesirable temperature (Kader, 2002).

The harvesting season for most of horticulture fruits and vegetables is relatively short. Therefore proper storage is needed to extend the marketing period of the horticulture products. Different storage methods are already in use. One of the common storage methods is air-cooled storage house. Cold storage is another type of storing horticulture products. This method controls temperature and relative humidity. Other storage methods are controlled atmosphere and modified atmosphere, these two methods controls concentrations of carbon dioxide and oxygen, in addition to the temperature and relative humidity (Liu, n.d.).

The accurate temperature and relative humidity management is important to provide most favorable environment for perishable fruits and vegetables along the cold chain. In new and advanced cooling and storage facilities using accurate temperature management tools are

common, Forced air is one of the cooling methods for horticulture perishable products (Kader, 2002).

#### **2.3.4. Transport**

It is essential to control the temperature for long distance transport. Grapes must be loaded on the truck in such a way to minimize the physical and mechanical damages as well as to allow proper air circulation to remove the heat from the product. Products should be cooled immediately after harvesting and before loading then on transit trucks. Temperature should be maintained at a proper level during the transport for long distances (Kader and Rolle, 2004).

According to a report by Roots of Peace in 2009, Refrigerated trucks were used to transport kishmishi table grapes from Shamali plain to Pakistani markets, but to reach the international markets like India, Dubai, Saudi and Kuwaiti markets air freights were used.

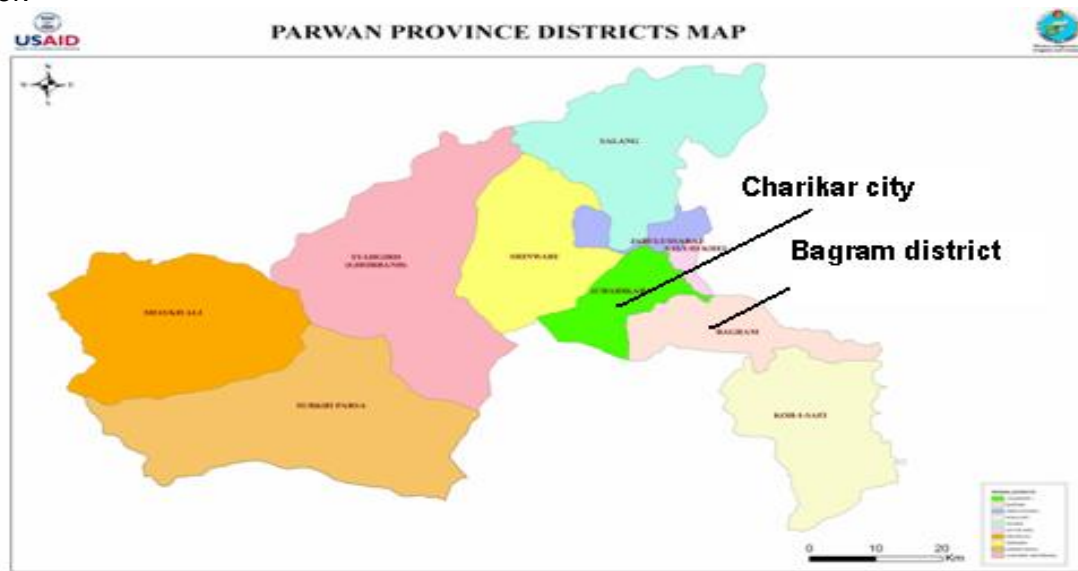
A successful agriculture is depending on well-developed and organized transportation system that delivers the products as cheaply as possible. It is also vital for both producers and consumers to link production and marketing of the produce (Koo, n.d.).

## 3. METHODOLOGY

### 3.1 Study Area

This explorative study was conducted to find the stages at which the quality of table grape deteriorates along the export chain. Therefore, two districts that have reputation in grape production in Parwan province were selected as the study area for the research.

The survey was conducted among grape growers in Bagram district and Charikar city (Figure 4) of Parwan province. Interviews were held with Parwan Producers Cooperative (PPC) and Bagram Grape Growers Association (BGGA) directors and extension workers in Parwan province. Also, personal interviews were arranged with grape exporters in Kabul city. Selection process of surveyed grape growers and interviewed people are explained in section 3.2 of this chapter.



**Figure 4: Parwan province districts map**

**Source:** USAID, 2008

### 3.2 Research methodology

This research had qualitative and quantitative approach based on desk study, field surveys and personal interviews. Primary data was collected from surveys and personal interviews by using semi-structured questionnaire and checklists. Desk study and third party generated reports and studies were used as secondary data.

#### **Desk study**

Desk study was important in researching literatures in order to provide background information about the current processes of grape production in Bagram and Charikar. Desk study information is used to compare with the findings of the research in chapter five. Followings are sources that were used during desk research and literature review.

- Grape value chain analysis reports
- Post-harvest handling technologies

- Quality management
- Post-harvest handling in developing countries
- Export problems in Afghanistan

## Survey

Semi-structured questionnaire was used to collect primary data through field research; Based on the objective of the research and its relevance to the grape growers, this questionnaire (Annex 1) was prepared. Five grape growers were surveyed to pre-test the questionnaire before conducting the actual research in the field.

A survey was conducted among thirty grape growers in both districts of Parwan province. Fifteen Respondents were randomly selected from each registration lists of Bagram Grape Growers' Association and Parwan Producers' Cooperative. The questionnaires consisted open and close ended questions that tackled issues related to grape production, factors affecting quality of table grapes, constraints during production, harvesting, marketing and type of extension services they received. It also focused on general information of grape growers like land holding size, level of education and their age.

Questionnaires were filled in by the author in person during the period of field visits (survey) from 20<sup>th</sup> July to August 15<sup>th</sup> in both districts. Additional field observations were also made and relevant information to the research was noted.

## Interview

Interviews were conducted with five table grapes export companies in Kabul Fruit Market (KFM). Checklist was used to interview these exporters and tackle issues related to post-harvest handling of grapes, quality standards of markets, constraints in different steps of post-harvest handling and post-harvest losses (Annex 2). Parwan Producer's Cooperative (PPC) and Bagram Grape Growers Association (BGGA) directors were interviewed to get an overview of table grape chain (Annex 3). Also, two interviews were arranged with extension workers representing the Directorate of Agriculture, Irrigation and Livestock of Parwan province and Solidarity Afghan Belgium (SAB) (Annex 4).

**Table 4: Summary of Survey and interview participants**

No	Actors and stakeholders of Parwan table grape chain	Interview	Survey
1	Grape Producers		30
2	Exporters	5	
3	Cooperative/Association director Directors	2	
4	Extension workers	2	



## Data Analysis

In order to analyze the data, Statistical Package for Social Science (SPSS) and Microsoft Excel were used to produce tables, graphs, calculate means of different variables etc. Chain mapping was employed to visually present Parwan table grape chain and SWOT analysis was used to analyze internal and external situations of the chain.

### 3.3 Time schedule

Table 5: Time schedule

Activities	11-Jun				11-Jul				11-Aug				11-Sep	
Preparation of research proposal and literature review				X	X	X								
Data collection/ Fieldwork							X	X	X	X				
Data Analysis and processing									X		X	X		
Preparing first draft report										X	X	X	X	
Submission of final report														X

### 3.4 Research framework

Research framework shows that the research starts by literature review, survey and interviews, and then the results of the survey and interviews are analyzed separately. Later on, results are discussed in the light of literature review. At the end it is concluded and recommendations are given based on the findings and discussions.

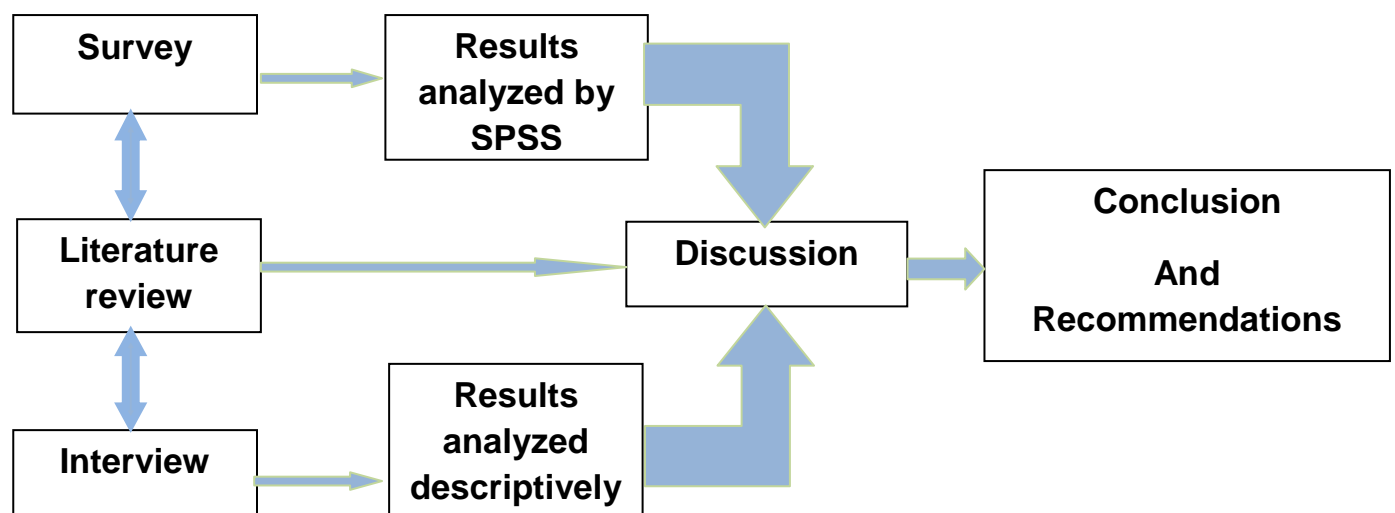


Figure 5: Research methodology

## 4. RESEARCH FINDINGS

The major purpose of this chapter is to describe the potential factors influencing the quality of table grape during the export chain of table grapes in Parwan province; it will be based on the results of the research. Section 4.1 show the structure of table grape chain which is obtained from the interviews with the Parwan Producers Cooperative (PPC) and Bagram Grape Growers Associations (BGGA) directors as well as exporters. Section 4.2 up to section 4.7 of this chapter shows the outcome of the survey, which was conducted among thirty grape growers in Bagram district and Charikar city. Section 4.8 of this chapter shows the results of five interviews among the table grapes export companies, and finally result of interview with extension workers is showed in section 4.9.

### 4.1 Structure of table grape chain (Chain map)

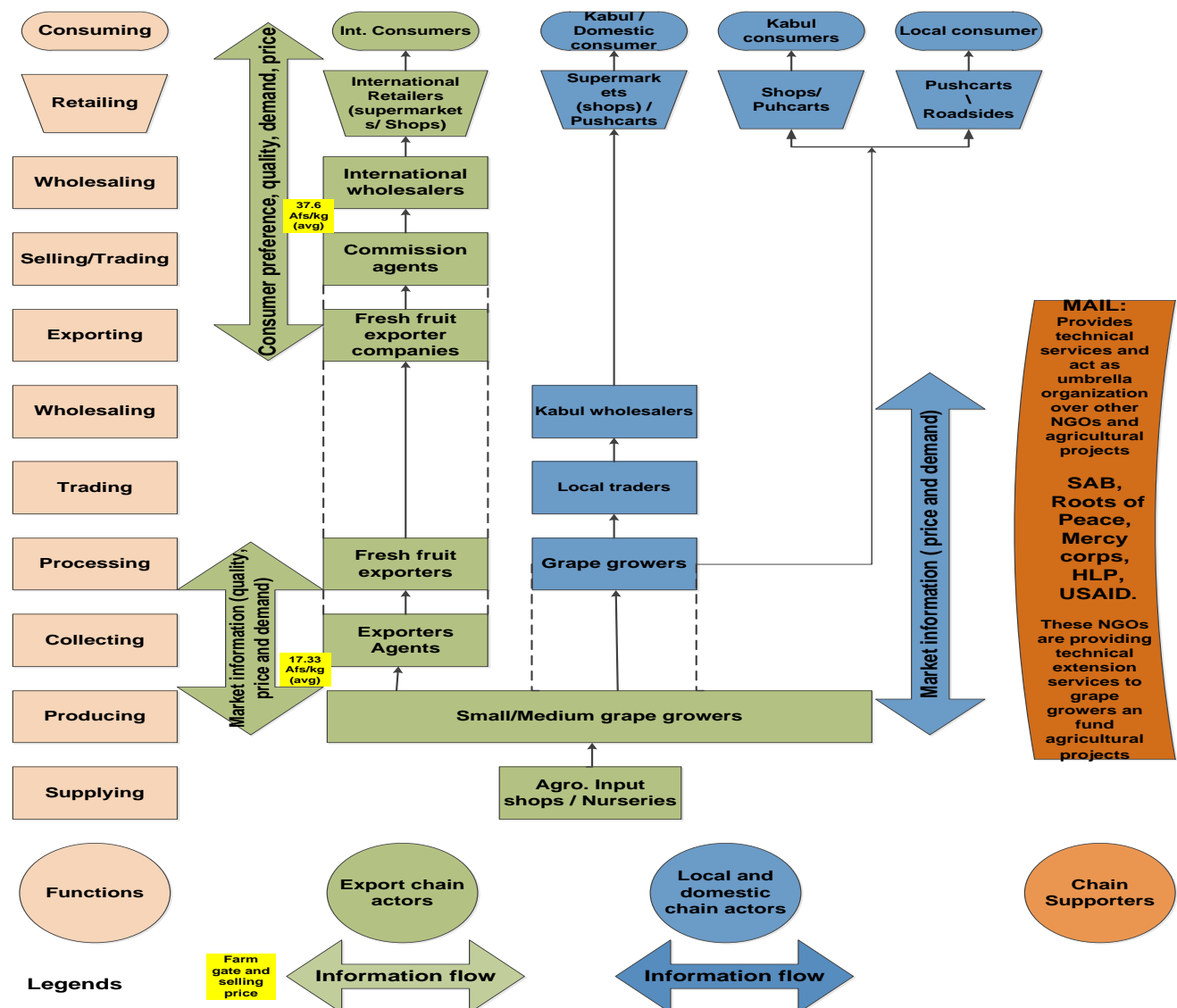


Figure 6: Chain map

Three chains exist for Parwan table grapes (Figure 6).

**4.1.1: Chain 1:** This is the main chain for Parwan table grapes. The main stakeholders in this chain consist of input suppliers, producers, commission agents, exporters, commission agents/traders, wholesalers, retailers, and end consumers. On the other hand, there are internal and external supporters to the chain. The supporters include but not limited to Ministry of Agriculture, Irrigation, and Livestock (MAIL); and Non-Governmental Organizations such as Solidarity Afghan Belgium (SAB), Roots of Peace, and Mercy Corps. Each stakeholder at this chain has its own importance and influence that is discussed briefly below.

**i. Input suppliers:** Input suppliers include local agricultural markets that supply agricultural inputs such as fertilizers and pesticides to grape growers. Input suppliers could also be nurseries that provide certified sapling to grape growers for improving production and quality of table grapes.

**ii. Producers:** Producers in this chain consist of small to medium scale grape growers with average 2 to 4 jerib of land holding size. They purchase their inputs from Charikar input suppliers, which are located in the center of the province. Grape growers under focus area of research are using traditional methods of agricultural practices like pruning, fertility, integrated pest management, irrigation, using lime sulfur and harvesting. Some of the producers are organized in cooperative or associations, but some others are not. Producers, who are organized in cooperatives or associations, do not sell their products through the organizations, but they market their products individually; this makes their bargaining power weaker. Producers are responsible for harvesting and their family members are involved in harvesting or they hire children or unskilled jobless people because they harvest for cheaper price and providing harvest training to these labors are costly and producers will not be rewarded at the time of selling. Producers sell their produce between 15 Afs/kg to 20 Afs/kg depending on variety and quality of grapes after harvest to commission agents hired by the exporters (Annex 5). These producers usually get paid in two tranches. First payment is received at the time of harvest, and the second will be collected after agents deliver the product to the exporter.

**iii. Commission agents:** These are people hired by the exporters on commission. They go to producers check the quality of grape in the vineyards, negotiate the price with the producers and buy on behalf of export companies. The company provides them with wooden crates, cardboard boxes in order to buy, pack, and transport grapes to the main collection point (big trucks or trailers). Commission agents are responsible for sourcing the labors for sorting, packing and closing from the same village or nearby surrounding villages, these labors are paid by the exporter.

**iv. Processer:** After grapes are harvested by the growers, primary processing like trim, sort and package are done by the daily based labors hired by the export company.

**v. Exporters:** Exporters are the main stakeholders in the export chain as they are the key players and governors of the export chain. These are companies registered with Afghanistan Investment Support Agency (AISA), and are located in Kabul Fruit Market. These exporters have close relations with importers in other countries, but in this case these importers are acting as commission agents and get 6.5% commission from each consignment they receive from afghan exporters. However, they do not have any binding legal contract with them. Afghan exporters in most do not have any contract with importers of any country. This is due to the inconsistency of grape production and supply in Afghanistan. Instead, exporters transport the table grapes by road or by airfreight to target countries and then, the traders in those countries

will purchase the best quality of table grapes. The rest of them are considered as loss or it is sold for a very cheap price.

**vi. Commission agents/traders:** These are commission agents/partners of Export Company or they are traders acting as commission agents in Pakistan, India, and Dubai who are interested to have business with Afghan export companies. Due to lack of quality or inconsistency in quality grape supply, there is mistrust between them and their afghan partners. These agents will sell table grapes to wholesalers between 60 Pakistani rupees per kg (33 Afs/kg) and 77 Pakistani rupees per kg (40 Afs/kg), again these prices depends on quality and varieties of grapes.

**vii. Wholesalers:** These wholesalers buy table grapes in bulks and then they sell it to the retailers across these countries.

**viii. Retailers:** Afghan table grapes are then sold in the retail markets and supermarkets of the above-mentioned countries. Most of these retail shops and supermarkets have cooling facilities to keep table grapes for longer periods.

**ix. Consumers:** International consumers are the last actors in afghan table grapes chain; they buy them from the retail shops and supermarkets.

**x. Supporters:** Ministry of Agriculture, Irrigation, and Livestock (MAIL) provides technical services to grape growers. It acts as an umbrella organization over Non-Governmental Organizations and projects that support producers through providing technical trainings to increase the production, and improve the quality of table grapes. Different Non-Governmental Organizations such as Solidarity Afghan Belgium (SAB), Horticulture and Livestock program (HLP) and Mercy Corps are working with the producers. Solidarity Afghan Belgium (SAB) started a project in 2008 to increase the production of table grapes by providing extension services (technical information), established new orchards (vineyards), and helped grape growers make grape growers' associations. Currently SAB is working with the Grape Nursery Associations to produce certified saplings for grape growers in the region.

**4.1.2: Chain 2:** This chain represents the domestic chain of table grapes. Stakeholders in this chain are input suppliers, producers, local traders, wholesalers, retailers, and consumers. Ministry of Agriculture, Irrigation and Livestock (MAIL) and Non-Governmental Organizations (NGO) are also considered to be supporters of this chain through technical trainings and workshops.

Local input suppliers or agricultural depots provide pesticides and fertilizers like DAP, Urea, Sulfur, and other inputs to producers. There are also some nursery growers who provide certified buds and saplings to producers.

Producers in this chain sell their produce to local traders before harvest, because their produce does not reaches the requirements of international market and it is not selected by the agent or they do not agree on price with agents. Some of the producers harvest and pack table grapes in 7kg plastic bags or 7kg cardboard boxes and transport them to Kabul fruit market and sell it to wholesalers (Figure 7).

Wholesalers in Kabul fruit market have their own shops in Kabul fruit market. They are the ones who purchase table grapes from producers and then sell it to retailers who come from different parts of Kabul.

Retailers are small shops and pushcart owners. They purchase their grapes from the domestic wholesalers in Kabul Fruit Market. The process of transportation at this stage is also occurred in a manner that is not suitable for the quality of grapes. They stack the crates along with other fruits and vegetables on small rickshaws or cars.

The local retailers also do not have cooling facilities and most of the time grapes are placed in the sun. These factors affect the quality of the grapes in the domestic chain.



**Figure 7: producers selling their produce in wholesale market**

Local consumers are the end users of the produce on domestic level. They buy their table grapes from different places. Some might go to fruit market and buy in bulk each week, and others may buy grapes in shops and from pushcarts beside the roads.

**4.1.3: Chain 3:** This is a simple grape supply chain in which farmers buy their inputs from input suppliers who are shops selling fertilizers and pesticides to producers in Charikar city or in Kabul. In this chain farmers harvest grapes by themselves, pack them in plastic bags, bring them to the roadsides and sell them directly to consumers and passersby (Figure 8). Also, sometimes they transport their produce to Charikar city or Kabul city and sell directly to retailers. Retailers will sell grapes in their shops or on pushcarts.



**Figure 8: Farmers selling their produce in the roadside**

Ministry of Agriculture, Irrigation and Livestock and Non Governmental Organizations support these farmers as well, technical trainings like how to use pesticides and fertilizers, their application time and other agriculture practices.

## 4.2 Background information of grape growers

### 4.2.1 Age

This study, in broad sense, sheds light on how age data is distributed (Figure 9). The age data is normally distributed between 25 to 80 years old, and the average age of the respondents are approximately 49 years old which indicates that the farms are mainly run by the head of the family.



Figure 9: Average age of grape growers

### 4.2.2 Education level of grape growers

Figure 10 shows that among 30 grape growers that were surveyed in Charikar city and Bagram district sixty percent of grape growers were illiterate, sixteen percent of growers were graduated from high school and only six percent of growers were graduated from university.

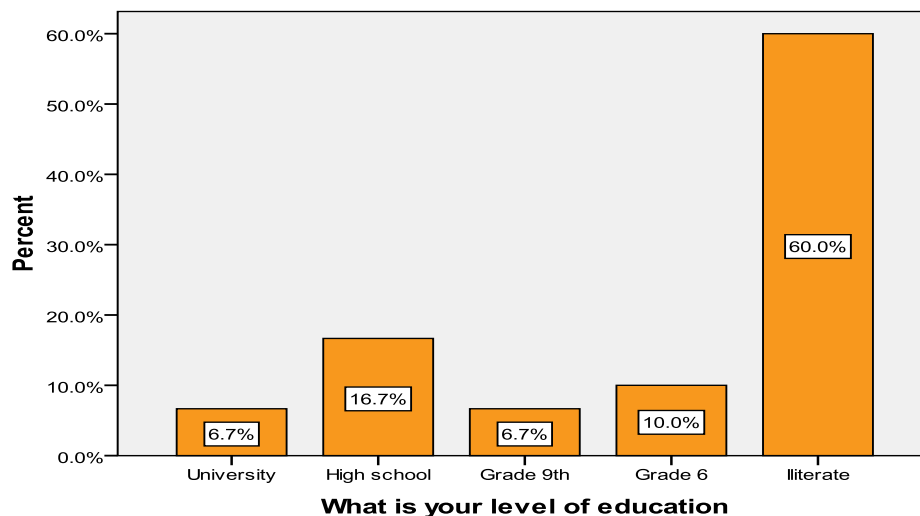


Figure 10: Education levels of grape

### 4.2.3 Land holding size of grape growers

Figure 11 shows the variation of land holding size, it is also concluded that the average land holding size among surveyed grape growers in Charikar city and in Bagram district is 5.6 jeribs.

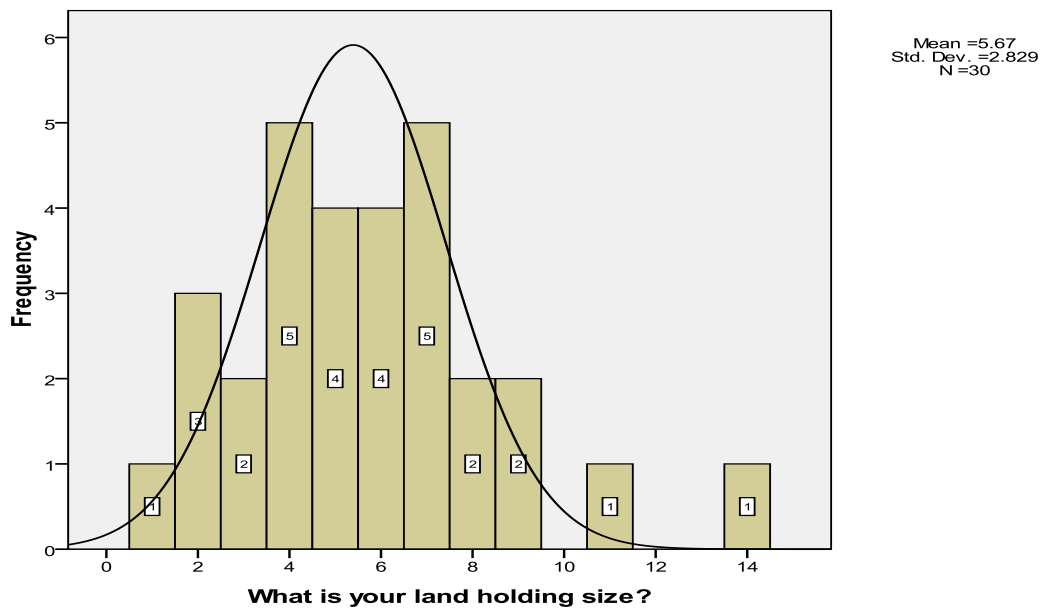


Figure 11: Land holding size of grape growers

### 4.2.4 Land holding size of growers between Charikar city and Bagram district

Figure 12 shows that land holding size in Bagram district is higher than in Charikar city.

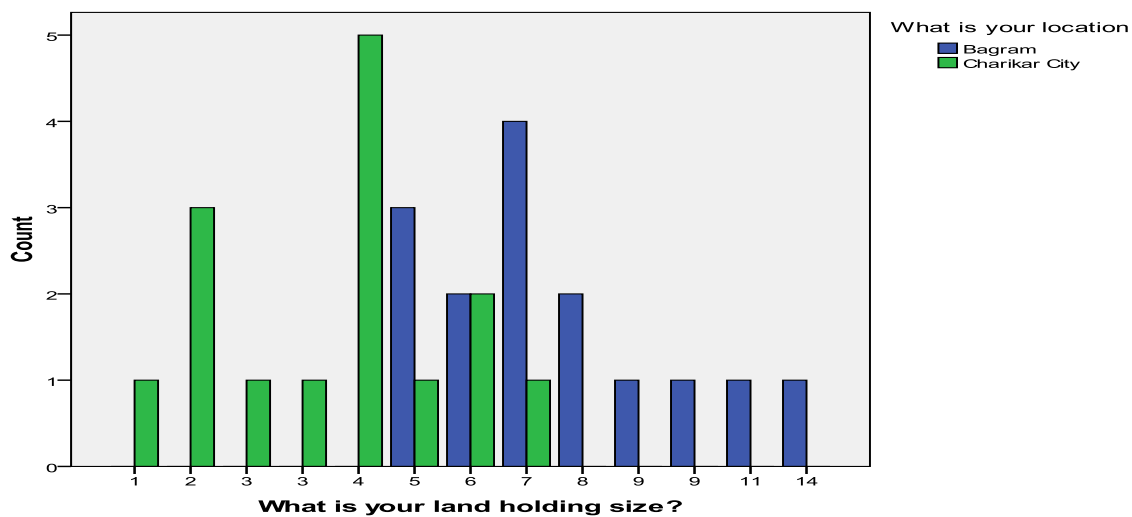


Figure 12: Land holding size between growers in Charikar and in Bagram

## 4.3 Grape production

### 4.3.1 Type of varieties grown by the grape growers

From this research and Figure 13 we can conclude that three main grape varieties are grown in Parwan province for export market. Shundulkhani is the highest growing variety with 40% followed by Kishmishi with 37% and Taifi with 23%.

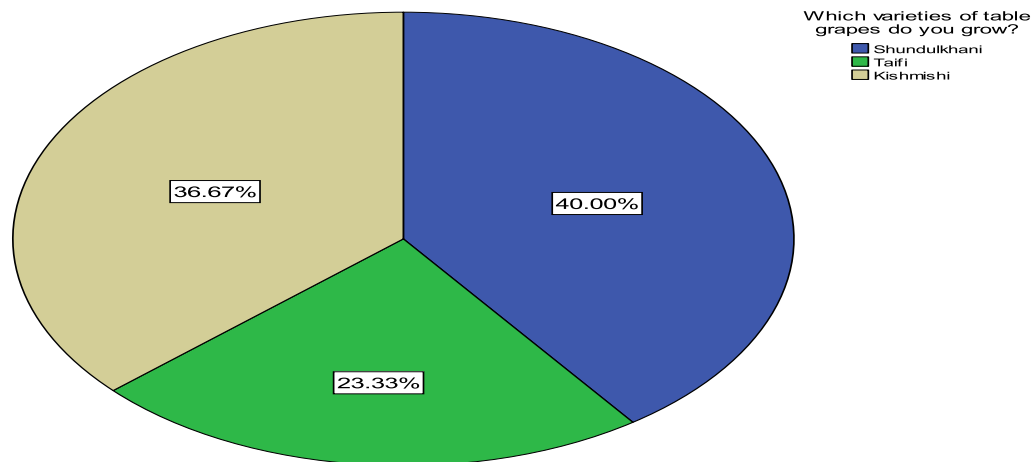


Figure 13: Types of grape varieties in Parwan

### 4.3.2 Factors influence quality of grapes during production

As it is shown in Figure 14 sixty percent of the respondents said that quality of grape is mainly influenced by both climate conditions (Rain, high humidity) and pest & diseases, but 33% of the respondents said that only pest and diseases influence their grapes during production and 7% of surveyed grape growers said that climate condition (Rain & high humidity) is only influencing quality of grapes in their vineyards.

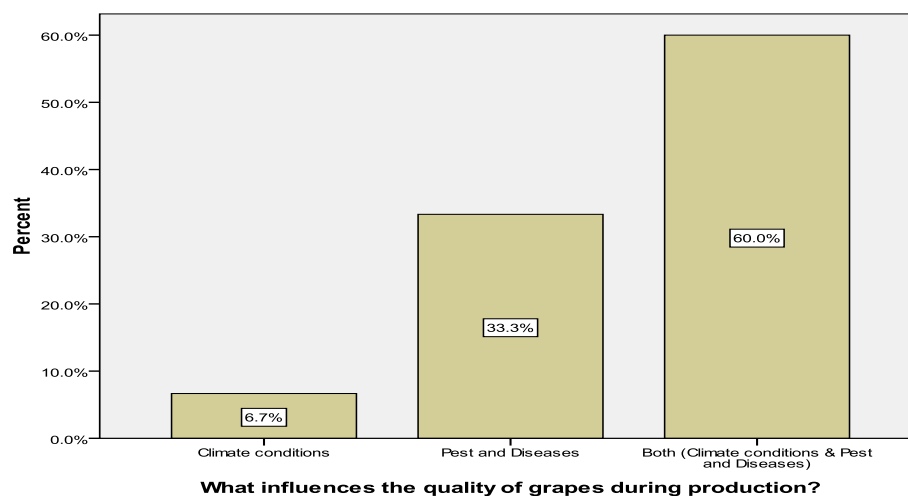


Figure 14: Influencers of quality during production



### 4.3.3 Pest and Diseases

Figure 15 shows that thirteen producers in Charikar city and nine producers in Bagram district said that powdery mildew is main disease which infects their grapes, only eight grape producers said that downy mildew and botrytis are the main diseases in both areas which they face in their vineyards.

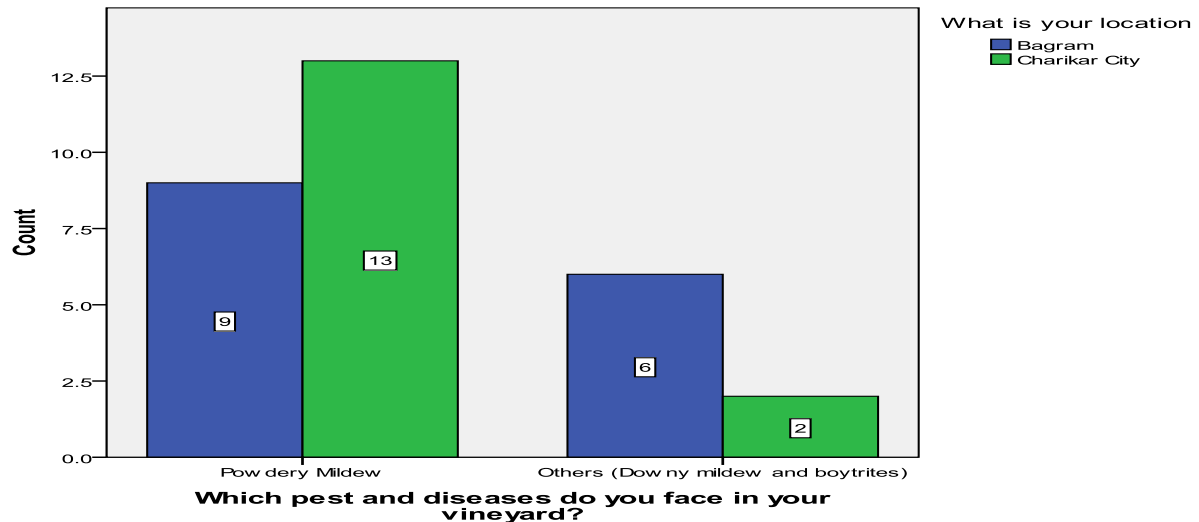


Figure 15: Pest and diseases available in the vineyards

### 4.3.4 Grape disease control

Pest and diseases are mainly controlled chemically by grape growers in Parwan province, Figure 16 shows that twenty one out of thirty grape growers surveyed said that they use chemicals to control pest and diseases, only the remaining nine producers said that they control pest and diseases mechanically and by using chemicals.

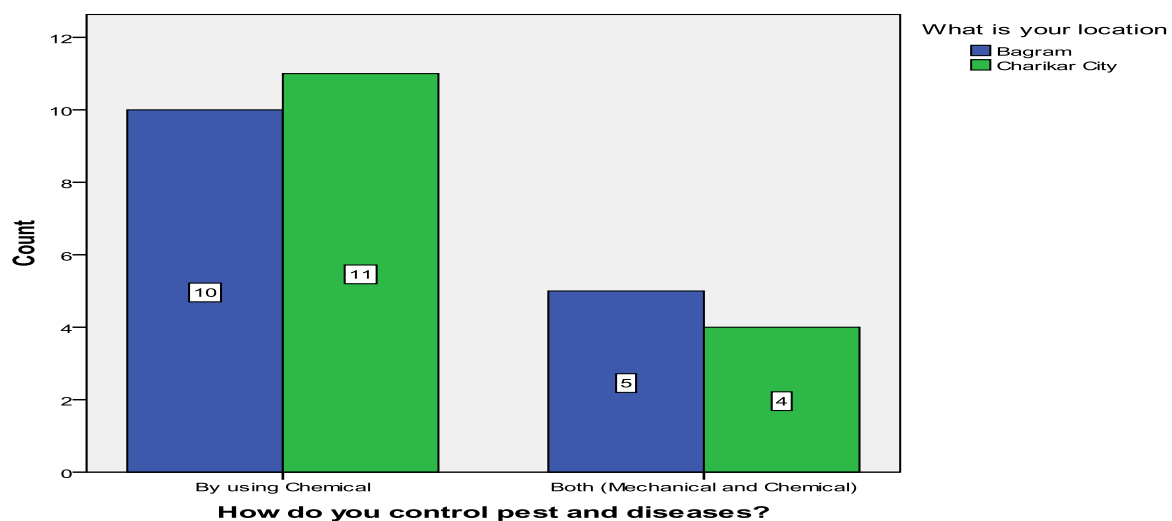


Figure 16: Pest and disease control

## 4.4 Extension services

### 4.4.1 Extension providers

Figure 17 shows that twenty two growers out of thirty said that NGOs are providing extension services to them and the remaining eight grape growers receive extension services from Directorate of Agriculture, Irrigation and Livestock (DAIL). Also we can conclude from bellow figure that NGOs are more involved with producers in providing extension services in Bagram district than in Charikar city, on the other hand government is the leading extension provider in Charikar city than NGOs.

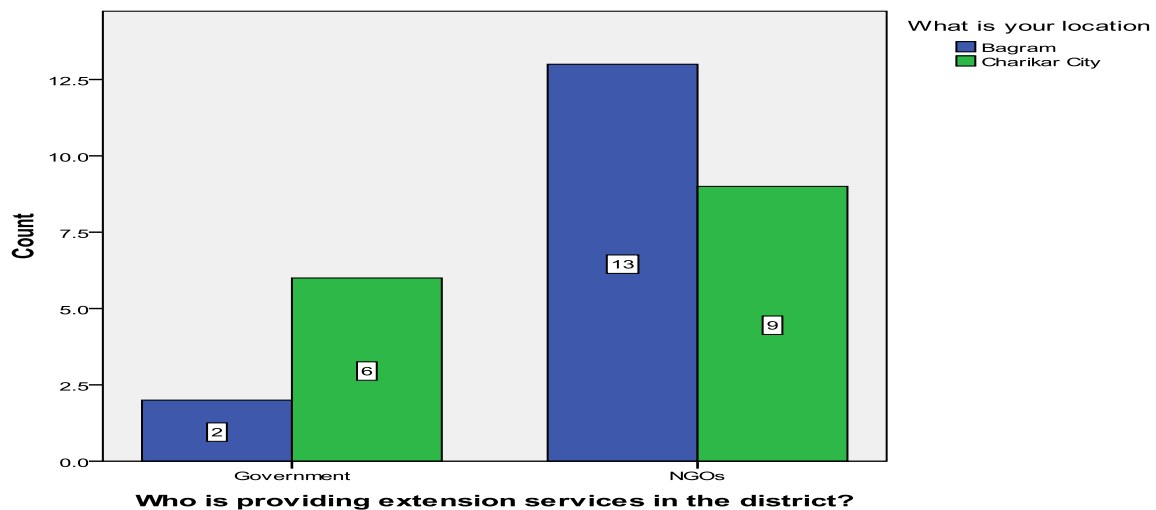


Figure 17: Extension providers

### 4.4.2 Type of extension and support to grape growers

Figure 18 show that ninety seven percent of the respondents said that they only receive technical information and only three percent of them are receiving marketing information.

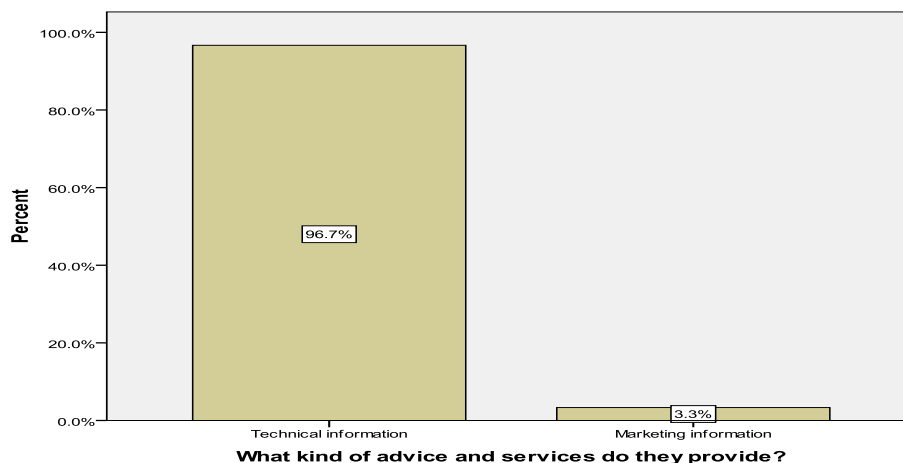


Figure 18: Type of extension service provided

## 4.5 Harvesting

### 4.5.1 Harvesting

Figure 19 shows that seventy seven percent of grape growers harvest table grapes by themselves and then sell to exporters (agents) and twenty three percent of the producers said that they sell their produce to agents of grape exporters in advance and they have the responsibility of harvesting.

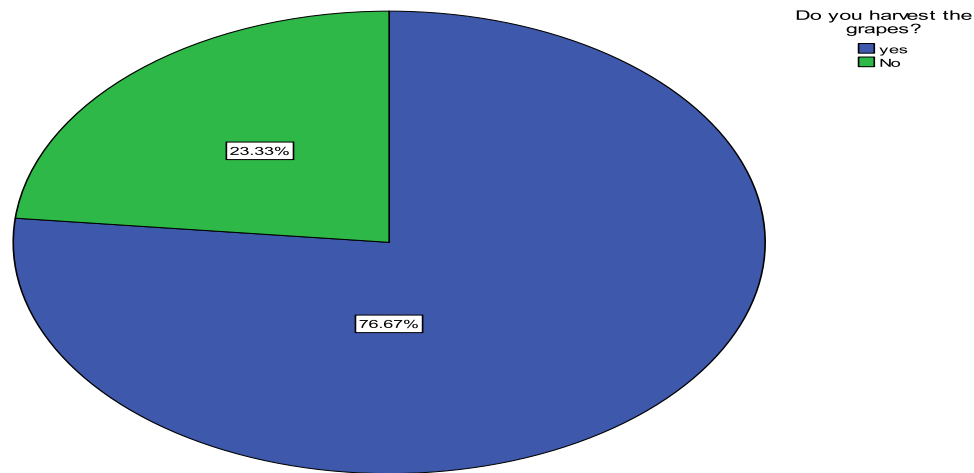


Figure 19: Harvesting table grapes

### 4.5.2 Harvest time

Figure 20 shows that there is not much difference in determining harvest time in both target areas of the research, sixteen out of thirty respondents said that they determine harvest time by color, size and taste, seven of them said that they consider color, size, taste and sugar level to determine harvest time and seven of the respondents (4.5.1) do not harvest grapes.

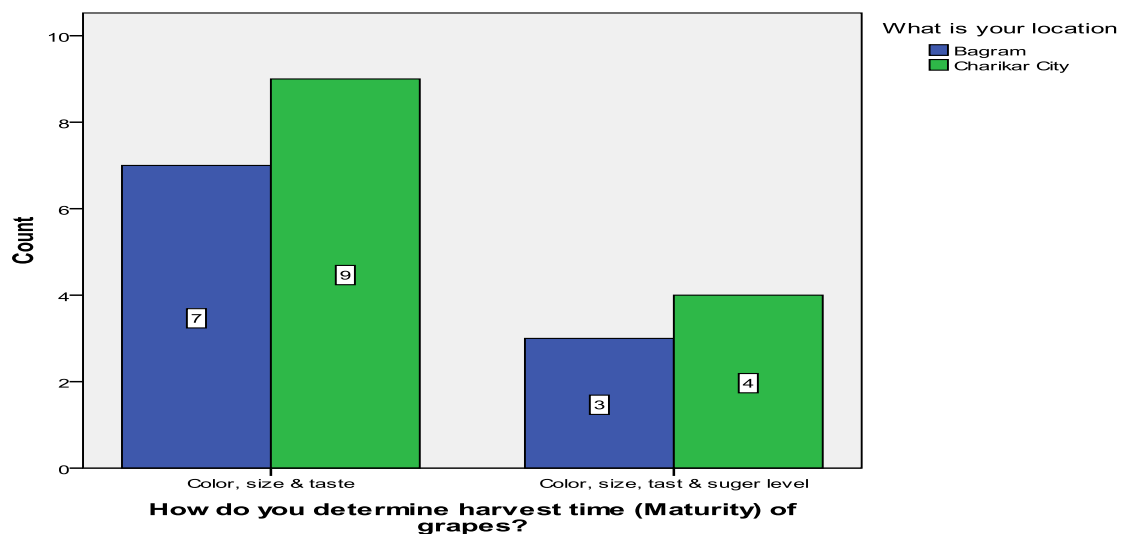


Figure 20: Determining harvest time of grapes

### 4.5.3 Harvesting tools

As it is shown in Figure 21 that ninety six percent of the respondents are using simple harvesting (cutters, local baskets, wheeler and hand for trimming) materials and remaining four percent is using both simple and standard (Cutting shears, Plastic lugs or baskets, clipping scissors) harvesting materials.

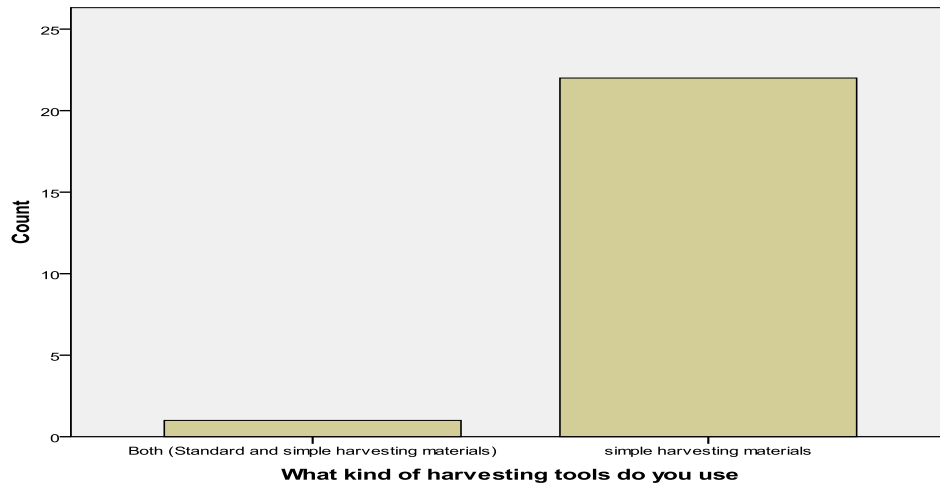


Figure 21: Harvesting materials

### 4.5.4 Harvesting problems

Figure 22 shows that sixty five percent of the respondents said that their main problem during harvesting is unavailability of harvesting materials and inexperienced harvesters and packers according to international markets. Thirty percent of the respondents said there are no experienced harvesters and packers and only four percent of the respondents said that they do not have access to harvesting and packaging materials.

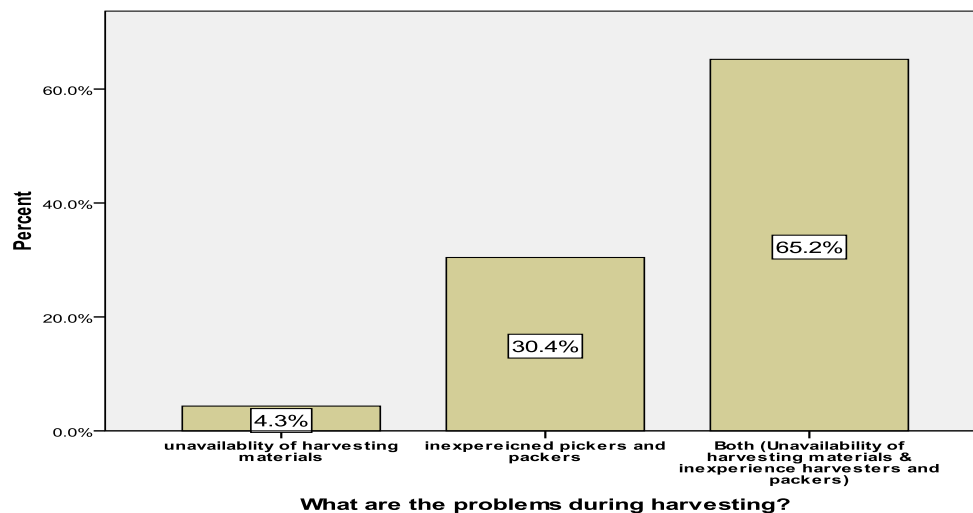


Figure 22: Harvest problems

### 4.5.5 Trainings

Figure 23 shows that thirty five percent of the respondents provide basic training to their harvesters who are employed by the grape growers at the same day of harvesting and the remaining sixty five percent of them do not provide any kind of trainings because it is costly and time consuming.

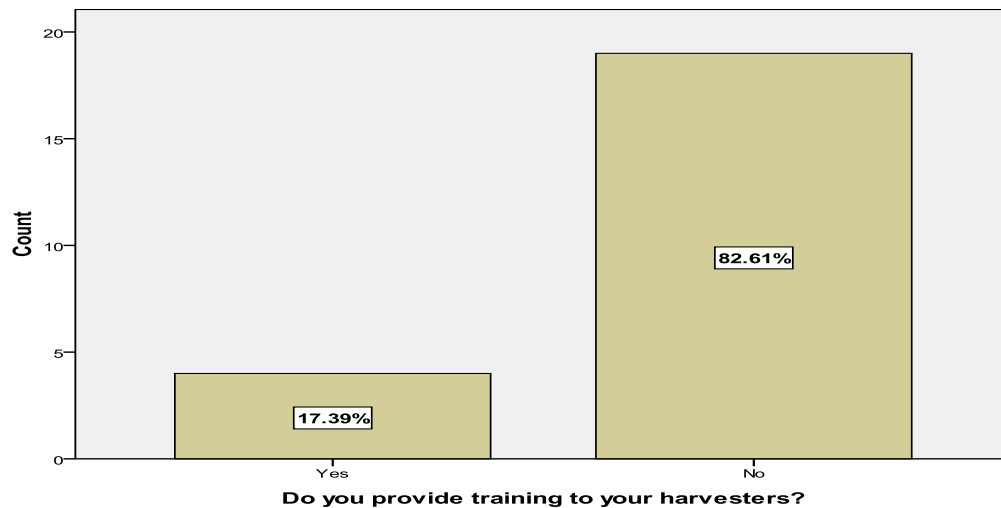


Figure 23: Harvest trainings

### 4.5.6 Type of training

Figure 24 shows that seventy five percent of respondents, who provide training to harvesters (Figure 23), provide basic picking and handling training to harvesters, while twenty five percent only gets picking trainings by the grape growers.

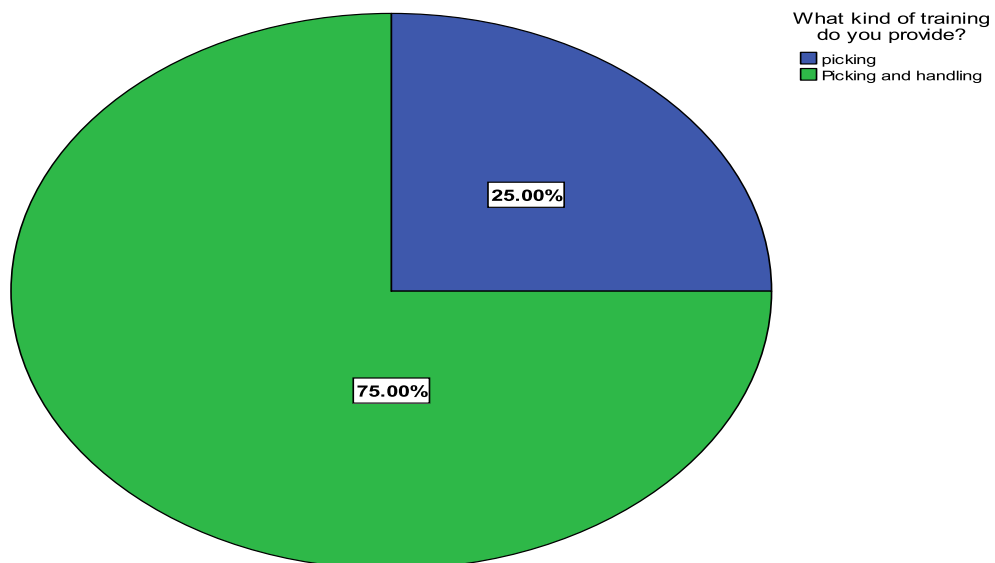


Figure 24: Type of trainings provided to harvesters

### 4.5.7 Value creation

Figure 25 shows that seventy three percent of the respondents said that table grapes are sorted and packed to create value to the product, while twenty percent of them said that there are other activities also like weightings, labeling and transport to add value to their products.

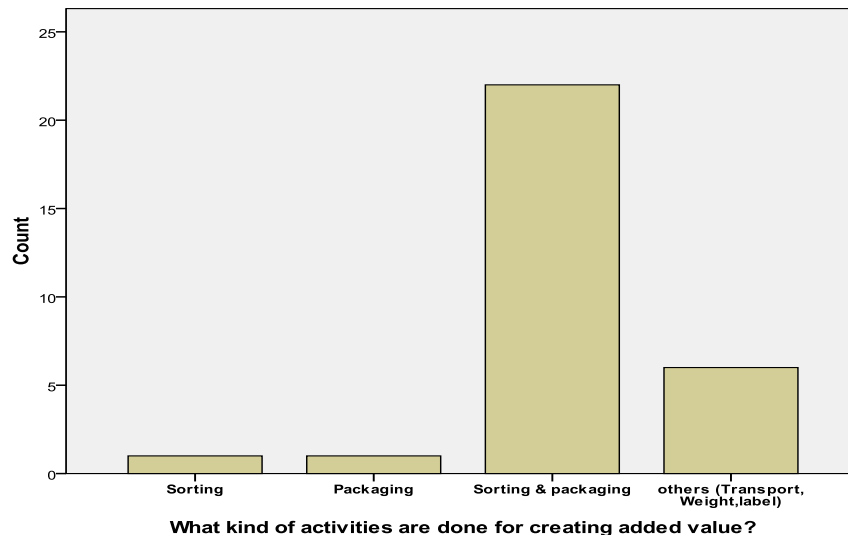


Figure 25: Added values to the product

## 4.6 Marketing

### 4.6.1 Selling time of grapes by producers

Figure 26 show that there is no difference in selling time of table grapes in both districts of Parwan province. Eighty to eighty five percent of surveyed grape growers sell their table grapes during harvest time and the rest sells their grapes before harvest time.

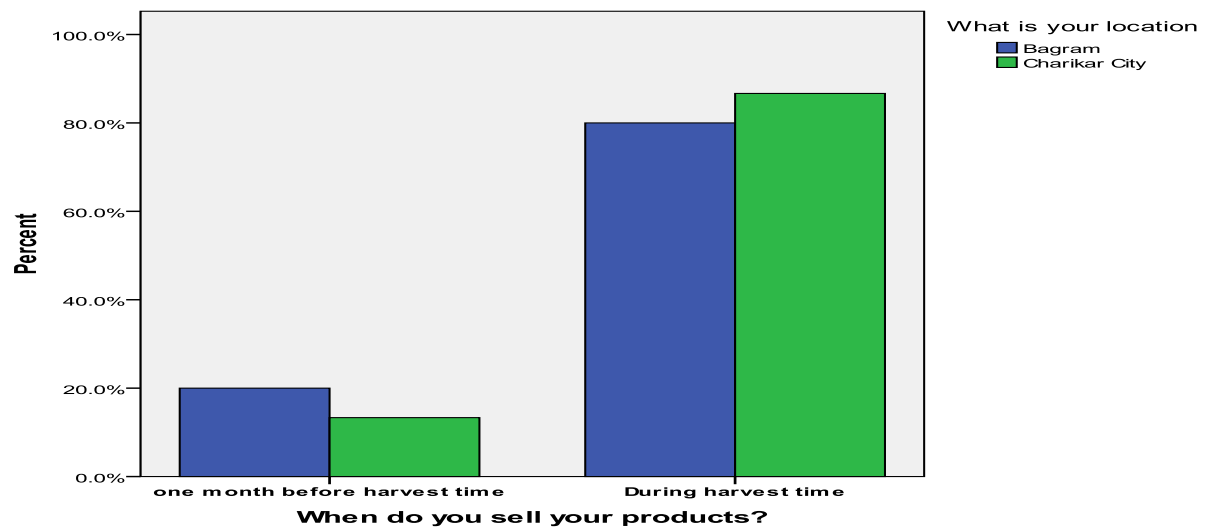


Figure 26: Selling time of table grapes

## 4.6.2 Buyers of table grapes

Figure 27 shows that all respondents in Bagram district sell their product to agents of the grape exporters, but in Charikar city eighty percent of the respondents sell their product to exporters and the remaining twenty percent sell to local traders who then transport it to Kabul and sell it there.

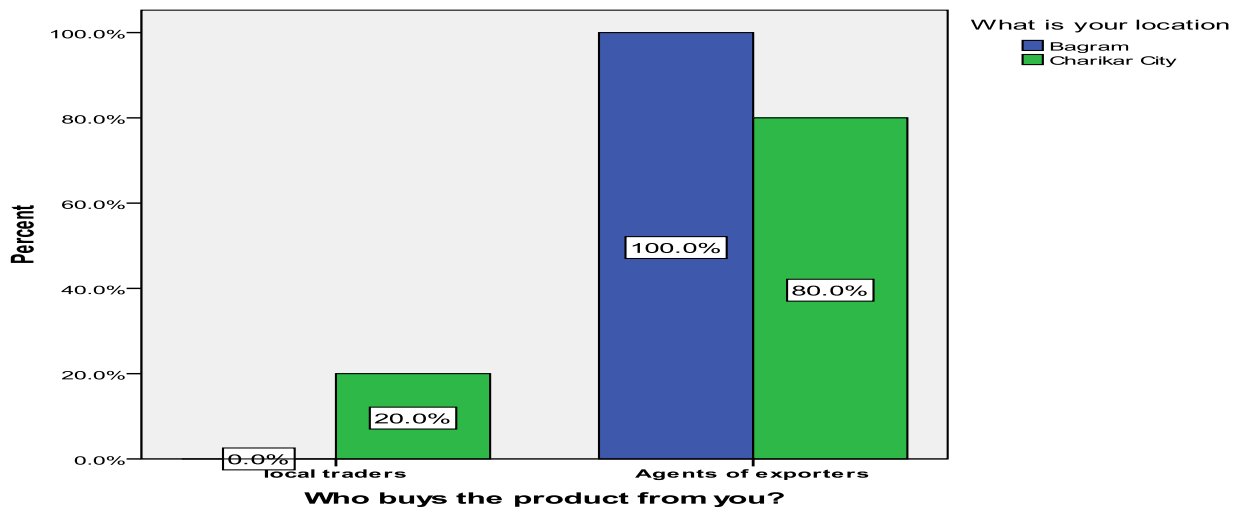


Figure 27: Table grape buyers in each district

## 4.6.3 Payment

Payment time is negotiated during fixing the price, Figure 28 shows that sixty seven percent of the respondents are paid during harvest time by the agents and thirty three percent of the respondents said that they receive their money in two phases; half of the payment is done during harvest and the remaining half is paid after harvest and delivery.

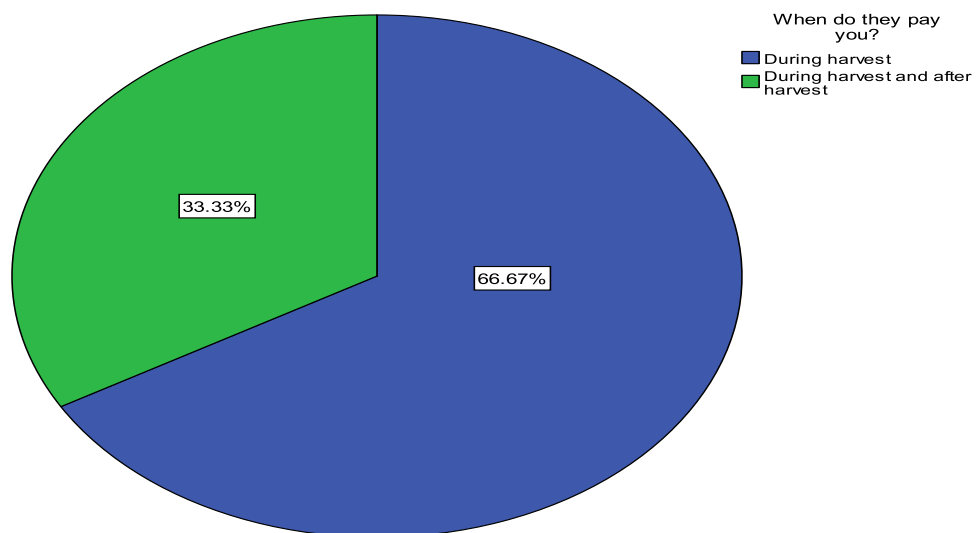


Figure 28: Payment time for grape growers

#### 4.6.4 Communication means

As it is shown in Figure 29 eighty seven percent of the respondents said that they communicate with the buyers (exporters) indirectly through agents and the remaining thirteen percent of surveyed grape growers said that they contact directly with exporters by meeting them in Kabul or they contact by phone.

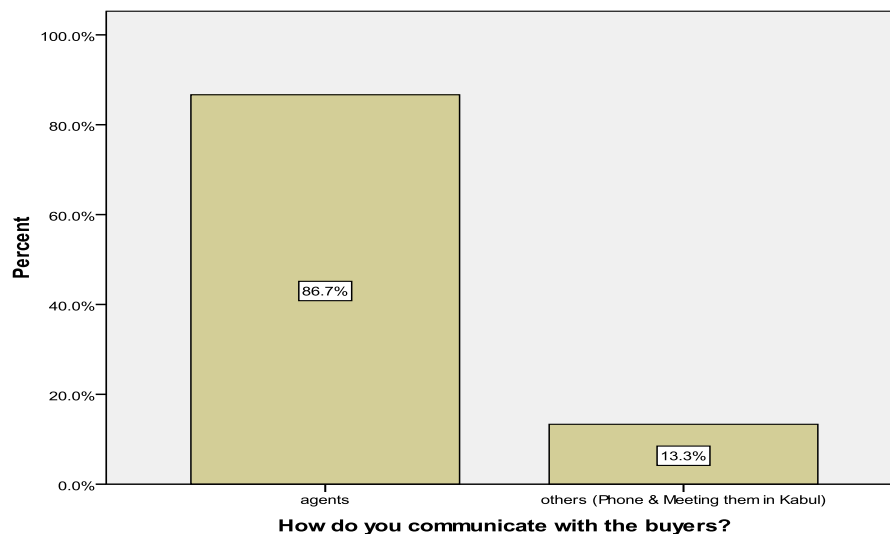


Figure 29: Communication between producers and exporters

#### 4.6.5 Market information

Figure 30 shows that forty three percent of the respondents receive market information from the associations, thirty three percent of grape growers share marketing information among themselves and local or district traders providing marketing information for twenty three percent of grape growers.

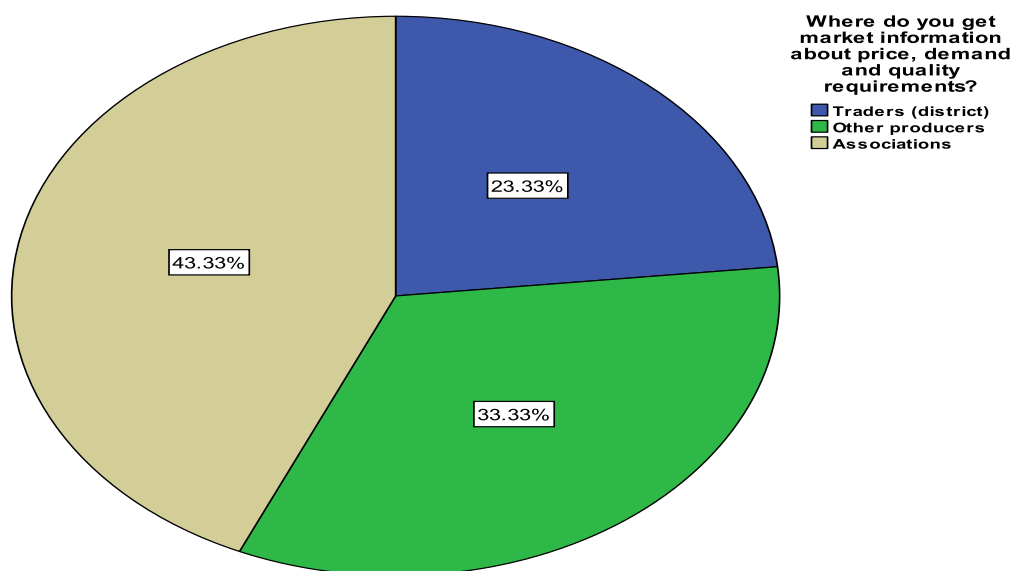


Figure 30: Source of market information (price, demand and quality)



## 4.6.6 Consumer preference

Figure 31 shows that almost all respondents (93%) know about the preference and requirements of international market which is big and even berries, well shaped bunches and free from diseases.

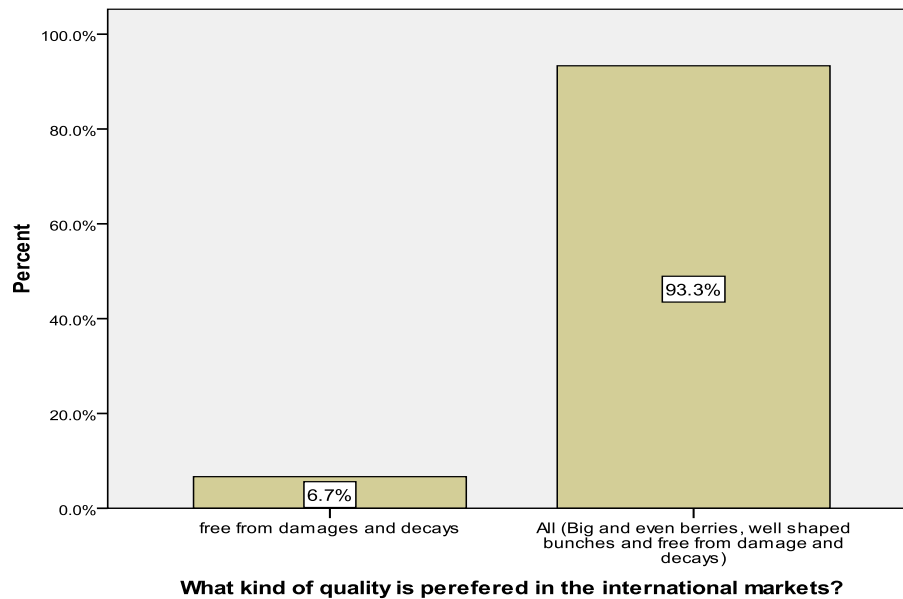


Figure 31: Quality preference of international market

## 4.7 Problems

Figure 32 shows the different problems and constraints that producers face in each district.

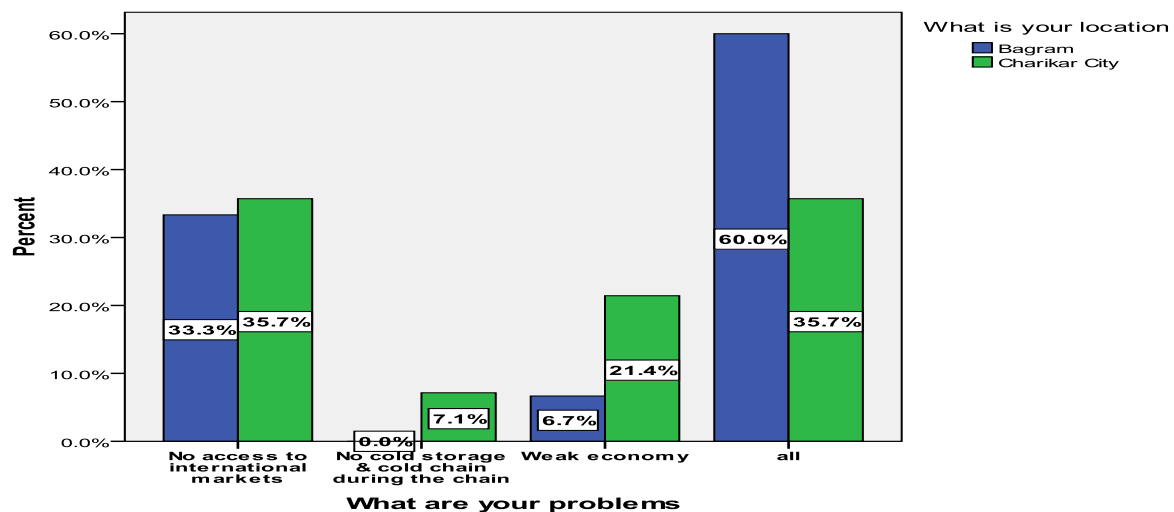


Figure 32: Main problems of grape growers

## 4.8 Results of interview with exporters

### 4.8.1 General information

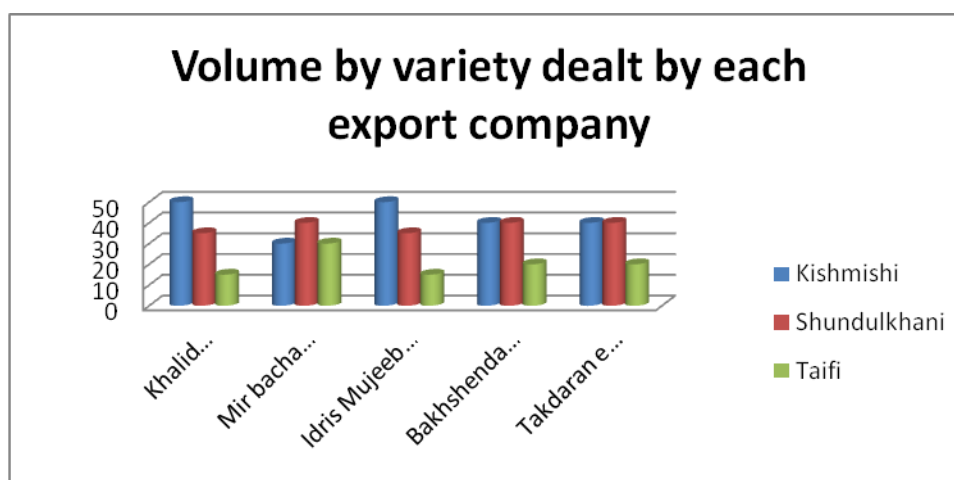
There are around fifty fresh fruit exporting companies in Kabul, Afghanistan out of which five companies were interviewed. These companies are officially registered with Afghanistan Investment Support Agency (AISA). These companies export fresh fruits such as table grapes, apple, pomegranate, peach, melon, watermelon etc. to other countries like Pakistan, India, United Arab Emirates, Russia etc. and as well as to Europe. All of the interviewed companies export specifically table grapes to Pakistan, India and as far as United Arab Emirates. According to the data collected, the total volume exported by these companies makes up approximately 11900MT annually. The main varieties of grapes exported consist of Kishmishi, Shundulkhani, and Taifi. Table 6 shows the country, type of variety with percentage and total volume deal by a company during a season.

**Table 6: Characteristics of export companies**

Companies	Export countries	Varieties deal with in (%)			Volume deal in per season/kg
		Kishmishi	Shundulkhani	Taifi	
Khalid Shekeeb	Pakistan	50	35	15	2800000
Mir bacha kot Ltd	Pakistan & India	30	40	30	2100000
Idris Mujeeb Ltd	Pakistan, India, Dubai	50	35	15	2100000
Bakhshenda Ltd	Pakistan	40	40	20	2800000
Takdaran e Kohdaman Ltd	Pakistan & India	40	40	20	2100000

### 4.8.2 Varieties dealt by the exporters

Figure 33 show that three main varieties of grapes include Kishmishi, Shundulkhanim and Taifi. The companies interviewed mainly deal with these three varieties of grapes. Kishmishi grapes comprise around 42% of exports, Shundulkhani and Taifi makes 38% and 20% of total grape exports of Afghanistan consequently.



**Figure 33: Volume of varieties dealt by exporters**

### **4.8.3 Purchasing of table grapes**

Since most of the exporters are based in Kabul Fruit Market (KFM), they usually do not have direct access to vineyards. There is an intermediary or so-called agent that facilitates the process of purchasing. During the grape season, the agents hired by the exporters are provided with the specifications and quality of grapes (free from disease, damage, specific varieties). The agents survey each individual vineyard in different villages and provinces to find the best match for the best price and deliver it to Kabul. In return, the agents make commission based on the orders they complete.

### **4.8.4 Price setting**

As mentioned above, the agents are the intermediaries between the exporter and the grape growers. Agents, based on the quality and quantity of grapes negotiate the price with the grower. On the other hand, the growers inquire the market prices through other agents or acquaintances. The price also depends on the type of grape they are negotiating. Once the price is agreed upon, the grape grower is either paid immediately on the spot or after delivery is made. Payment terms solely depend on the terms of the deal.

### **4.8.5 Value addition**

After a deal is made grape growers harvest the grapes. The harvested grapes are then put in a tent or shade in order to be packed. Usually exporters are responsible for post-harvest handling process like sort, pack and transport.

In order to add value to the product, they trim, sort, and pack according to the market requirements. The most common packaging requirements are 10.5kg and 14kg wooden crates and 7kg cardboard cartons/boxes. After packaging is done, they are then transported to Kabul and later on to the final destination or end consumers.

Since table grape is a quiet perishable fruit; trimming, sorting, and packing is done immediately in the vineyard after harvest by different untrained labor. Sometimes one person who is experienced, and knows how to pack does all these activities alone. Grapes are trimmed and sorted manually by hands, which is not the correct way. The packer(s) is/are told to pack as fast as they can, and this act itself affects the packaging quality of grapes. Normally they place second and third grade grapes at the bottom of the crate or box and first grades on top in order for it to look good. However, this is one of the causes of rejection and/or low price by the end market.

### **4.8.6 Storage**

Storage is the main issue of grape exporters, there is no cold storage facility in the region to store table grape in order to maintain the quality and to keep them for long. Therefore, they try to deliver the product to the final destination within one day. There is usually over supply of grapes during the months of August and September. Having access to cold storages they could store table grapes for more than four weeks and control the low prices during the peak season.

According to the exporters, though they have gotten trained on storage methodologies; they have not practically experienced storing. They are unaware of the adequate temperature and relative humidity for storing table grapes. Their biggest complaint is from lack of cold storages and cooling system in the export chain. Without cooling system in the chain, grapes deteriorate faster and water loss occurs from the moment of harvest until it is transported to the final consumer.

#### 4.8.7 Transport

The exporters are usually responsible for the transportation. In this case, all exporting companies interviewed were responsible for transportation to the final destination.

After grapes are packed in the vineyard then it is brought on to the roadsides and awaits small trucks. Improper handling during transportation affects the quality of table grapes in different ways (Figure 34) as mentioned below:

- Packaged grapes are shifted to the roadside in a very basic and unprofessional manner. The boxes are either carried on donkeys or labors carry them by hands.
- Improper loading is another stage where the quality of table grape is negatively affected



**Figure 34: Carrying crates by hand and loading of table grapes in trucks**

The small truck moves around and collects crates and boxes from different vineyards. When it is full it heads toward Kabul where all small trucks are unloaded and then loaded on a big transport truck or trailer. Unloading from small trucks, and loading on to big truck occurs during the mid-day under sunshine (usually 35<sup>0</sup> C). The process of unloading and loading takes hours since it is done manually (Figure 35).



**Figure 35: Reloading of crates from small truck to trailers**

At the same day the truck heads to Pakistan or to India through Pakistan. None of these trucks have cooling system installed. Custom and Afghan-Pakistan border is the place where trucks are delayed for hours.

There are different factor that affect the quality of table grapes during transportation and handling of table grapes for export market. Temperature is the main cause of quality deterioration during transportation. Temperature affects table grapes during transportation in many stages like:

- Small truck moves around on bumpy and dirt roads in the heat under the sun to collect crates and boxes from different vineyards
- It does not have any cooling system installed nor it is covered with tarpaulin
- Unloading from small truck and loading into the big truck takes place in the sun for hours
- Big export trucks also do not have any cooling system
- Delays in checkpoints, customs, and border also affect the quality of table grapes. Temperature at the border is very high, and deteriorates the quality of table grapes very fast

#### **4.8.8 Marketing**

There is usually no legal or written contract between the afghan exporters and the importers in other countries, because there is no stable table grape production and supply in Afghanistan. However, afghan exporters have mutual understanding and agreements with the traders in Pakistan and India.

Afghan exporters before delivering the grapes, get orders and specifications of quality and quantity from Pakistani and Indian markets through their agents. Also, they inquire about market prices in both countries. Quality requirements of these two markets are usually big size of berries, even and well-shaped clusters, yellow and yellowish color, and most importantly the grapes should be free from any disease and physical damages. The demand for afghan table grapes in Indian market is around September - October (one month later than Pakistani markets).

These traders are mostly commission agents and at the arrival of the delivery they will sell it in the Pakistani or Indian markets and get 6.5% commission for their work.

#### **4.8.9 Losses**

All table grape exporters mentioned that they have high losses in their business, but the losses are in different stages like:

- Sorting and packing: The export company disqualifies around 10% of the grapes for exporting purposes. These losses are then dried to raisin.
- Transportation: As mentioned in section (4.8.7) exporters are responsible for the transport and there are different causes for the losses during transportation such as improper handling of crates or boxes during loading and unloading, high temperature while loading during the day, and delays in the checkpoints, custom and the Pakistani border. When the

truck arrives in Pakistan about 15% to 20% of table grape is lost due to the above mentioned causes, losses at this stage is considered as waste.

#### **4.8.10 External factors**

There are some external factors that affect these export companies positively or negatively like:

- Competition: there are some competitors that provide grapes for lower price than afghan exporters
- Unnecessary checkpoints and illegal customs along the way to Pakistan
- Delays in the customs and borders
- NGOs are supporting the exporters by providing training on marketing
- Political situation and relationship of Afghanistan and Pakistan
- Satisfaction of one Export Company from the government about supporting them inside Afghanistan and dissatisfaction about trading policies of Pakistan government.

#### **4.8.11 Problems**

There are different problems that these export companies mentioned and they are listed below:

- Weak relationship between producers and exporters
- Unskilled labors
- No access to cold storage
- Unavailability of cold chain for afghan table grapes
- No access to alternative international markets
- Delays in the custom and borders
- Unnecessary checkpoint and illegal charges

### **4.9 Supporters (extension services providers)**

Extension workers from Directorate of Agriculture, Irrigation and livestock (DAIL) and Solidarity Afghan Belgium (SAB) were interviewed to know what kind of support they provide for the chain actors. Extension workers of both organizations where high education (Bcs in agriculture), they have good experience of working in the field. Table 7 shows the result of interview with extension workers.

**Table 7: Service provide by extension workers to farmers and exporters**

Questions	SAB	DAIL
Do you visit farmers or they come to you for support?	We are going to the field and visit farmers	We are going to the field to visit farmers and they also come to us for support
How often do you visit them?	Our work is to work with the producers, so we are most of the time in the field. (3 to 4 days in the field)	Twice a week
What kind of service do you provide?	We normally arrange different trainings about agricultural practices; We also support them to get organize in groups or associations, demonstration orchards,	We provide technical support to farmers like pest and disease control, weeding, irrigation, fertilizer and pesticide application.
In your opinion, what are the problems that farmers have related to grape production and post-harvest handling?	Most of the grape growers are illiterate and they do not have the knowledge of current technologies of grape production, they have low harvesting, sorting and packaging skills that affect quality of grapes. A limited storage facility in the region is another problem faced by growers.	Old and traditional farm practices and not adopting the new technologies of grape production. No cold storage facilities.
What are the problems you face in the field, as an extension worker?	It is difficult to convince farmers to adopt new technologies which are already tested in demonstration orchards. It is difficult to gather a group of farmers because of their low interest.	Transportation facilities are the main problem that we cannot visit farmers regularly, any refresh courses and trainings of new technologies for extension workers.
What kind of service and support do you provide to exporters of grapes?	We are working at the farmer level so we are not providing any type of support to the traders and exporters, but there are some other NGOs who support and provide marketing trainings to traders.	We do not provide any kind of extension or support to exporters of grapes.
In your opinion, what are the problems faced by exporters during post-harvest handling?	There is no cold storage facility for the exporters to store their products and they face huge losses, unskilled labors during sorting, grading and packaging of grapes, in adequate infrastructure and transportation system.	They have no direct contact with the farmers, their agents is not paying more attention on quality during post-harvest handling of grapes, cold storage and cool trucks



As a result we can say that only technical training is provided to grape growers by Directorate of Agriculture, Irrigation and Livestock (DAIL) and Solidartie Afghan Belgique (SAB). These technical trainings cover Integrated Pest Management (IPM), field's days, proper use and application of fertilizers and pesticide at the right time and right dosage/amount. SAB supported the grape growers to organize themselves in a form of associations to make the support process faster.

Illiteracy is the main hindrance for producers to adopt new technologies in production as well as post-harvest handling process. The process of post-harvest handling is done in a basic manner which affects the quality. Picking, sorting and packaging of table grapes is done by unskilled daily labors that are not train for these activities. Access to facilities like transportation in order to gathering producers and convincing them for adopting new and tested technologies is a challenge for the extension workers, also there is a need for refresh course on new technologies for the extension workers.



## 5. DISCUSSION

The previous chapter focused on the presentation of findings and initial analyses of the survey conducted among the grape growers. During the research grape growers were surveyed, interviews were made with directors of cooperatives, associations and also with some export companies. This chapter will focus on comparing and discussing the results from the survey and interviews with the literature review presented in chapter two in order to identify the stages where the quality of table grapes is deteriorating along the export chain. Different sections such as value chain analysis, general and marketing information, pre-harvest consideration, harvesting, value addition, cold chain and finally SWOT analysis are focused in this chapter.

### 5.1 Value chain analysis of Parwan table grapes

There are three supply chains for Parwan table grapes.

Export chain is considered to be the main and the most important chain by the producers. Significant amount of grape production in Parwan province is exported because of higher return in the international markets as compared to domestic markets. The actors in this chain are input suppliers, individual grape growers, commission agents, exporters, commission agents/traders, retailers and consumers. Although grape growers in Parwan are members of cooperatives and associations, the table grape chain is not well organized; they market their produce individually with weak or no bargaining powers. There is a weak coordination among actors of the chain especially between grape growers and commission agents/exporters. Grape growers in the chain have hard time gathering market information regarding quality demands and prices.

Commission agents of Afghan exporters in other countries are mostly traders, After Afghan grape arrives in Pakistani or Indian markets, these commission agents will sell it in those markets and gets 6.5% commission for their work.

There are some losses at each stage of the export chain in table grape export industry. Exporters complain about losses during post-harvest handling process. As it is stated earlier, losses occur at sorting and packing stages due to unskilled workers. These losses make up about 10% of the total grapes, which later dried in the sun as raisins.

Improper handling of grapes during loading and unloading from one truck to another, high temperature and unnecessary delays at checkpoints, custom and border are the causes of losses during transportation. At the time of delivery at the final destination, 15% to 20% of grapes are lost due to the above-mentioned causes. Losses at this stage are either sold in a very cheap price or are considered as waste.

The price of table grapes in domestic or local chain is relatively cheap as compared to the export chain. In this chain there is no agent. There are grape growers who sell their produce to local traders or harvest by themselves and transport it to Kabul. They directly deal with the domestic wholesalers in Kabul Fruit Market (KFM). Actors in this chain are input suppliers, grape growers, local traders, domestic wholesalers, retailers and domestic consumers. This chain is also not organized and there is a limited coordination among the actors in the chain.

Input suppliers, grape growers, retailers and consumers are the actors of the local chain in Parwan, which is the smallest and simplest. Growers bring their produce to the roadsides in plastic bags or transport it to the local market and directly sell them to retailers. There is no coordination among actors in this chain.

Based on findings of the research, export chain of Parwan table grape is considered as the most important chain; therefore, this chain needs to be improved by linking the actors and building strong coordination among them. Information sharing should be made easy in order for the growers to produce and supply better quality of grapes and the required amount at the right time to the customer market.

Ministry of Agriculture, Irrigation, and livestock is one of the supporters of the chain. MAIL is the governmental entity that provides technical services to the grape growers. It acts as the umbrella organization over NGOs and agricultural projects that are supporting the grape producers. Different NGOs are currently working at the producer's level. These NGOs also provide technical support as well as marketing support to the producers. Solidarity Afghan Belgium (SAB) is one of the non-profit and non-governmental organizations that provide technical support to grape growers to increase their production and to improve the quality of table grapes.

Ministry of Agriculture, Irrigation, and livestock MAIL at the country level, and the agriculture directorate and its extension department at the provincial level provide technical services to grape growers. Most of the services that the government provides are regarding the production level. Use of chemicals, application times, and practical training of farmers to improve the production and quality of table grapes are some of the services that the government provides.

NGOs also support grape growers by providing technical extension services on how to increase the production and improve the quality of table grapes. Proper use of pesticides and sulfur at the right time with the right dosage can control pest and diseases and maintain the quality of table grape during production. NGOs also support grape growers to organize themselves in the form of cooperatives or associations. This will give them the bargaining power when they want to sell their products, but due to mistrust among the growers they act individually at the time of selling and marketing their produce. They only use associations when there is any support and assistance from the supporters.

## **5.2 Characteristics of grape growers and exporters**

Age is considered one of the factors affecting the grape growing industry in Afghanistan. The younger generation of grape growers seems to have open opinion toward adopting new techniques of growing, handling and distributing. However, the elder generations stick to traditional methods

Education in Afghanistan is directly proportional to the willingness of the growers to educate themselves of new techniques and methods of harvesting and handling, which leads to higher quality. The higher educated the growers the higher they are willing to adopt new and improved growing, harvesting and handling techniques.

The research reveals that there are differences of land holding sizes in the districts under focus. Growers in Bagram district hold bigger vineyards than growers have in Charikar city, but agricultural practices in both districts are similar. The average land holding size in both districts is 5.6 jerib per family or house hold.

Around fifty fresh fruit export companies are officially registered with Afghanistan Investment Support Agency (AISA). They export various types of fresh fruits such as table grapes, pomegranate, apple, peach, melon, watermelon etc. to international market such as Pakistan, India, United Arab Emirates, Russia and sophisticated markets of Europe. All interviewed companies export different varieties of table grapes to Pakistan, India as well as United Arab

Emirates if meeting importers' quality specification. Annually, approximately 11900MT of table grapes of the three main varieties are exported to above-mentioned countries. Kishmishi makes 42% of the total exports; Shundulkhani and Taifi make the other 38% and 20% of total estimated export volume of table grape respectively.

Based on the research findings most of the grape growers decide to sell their produce during harvest time, at this time of the season agents of exporter will visit the area and search for the best quality which is in accordance to the requirements of exporters and international markets.

Grape growers use different sources to gather information about the quality specification required by the exporters and prices in Kabul. Bagram Grape Growers' Association (BGGA) also gets market information from traders and exporters in Kabul Fruit Market (KFM) and shares this information with its members. Producers also share information among themselves. Having market information gives bargaining power to the producers while negotiating the price with the buyers.

After both parties get market information and inquire the price then they will negotiate the price based on variety, quality, and quantity of the grapes. Factors of quality include color, shape, size, cluster and being diseases-free. Grape growers have weaker bargaining power than the agents/exporters, because they want to skip the commission of the association or cooperative and deal individually by the buyers. At the same time of price negotiations, terms of payment are also discussed. Growers get paid during harvest or they get paid in two phases, partly during harvest and partly after delivery to the exporter.

Different grape varieties like Shundulkhani, Kishmishi, and Taifi are produced in the two focused districts of Parwan Province. Since exporters are based in Kabul Fruit Market (KFM), they usually do not have direct access to the vineyard and producers. On the other hand, producers in these districts are also not interested in transporting their products to Kabul Fruit Market (KFM), because there is no monetary reward in it. In order to reach the grape growers, there are agents hired on commission by the exporters that facilitate the purchasing process between exporters and producers. During grapes season these agents will travel to different villages and different individual grape growers. Based on the quality specification that the companies provide them, these agents search the best match for quality and price.

The following problems were identified during the survey of producers:

- Having no access to the international markets aside Pakistan, India and partly UAE, Costly airfreights and the political relationship with Pakistan are the main problems that limit access to the international markets.
- Temperature is the main issue that affects the quality of table grapes after harvest, since table grape is a perishable product with short shelf life, therefore, it needs to be cooled immediately after harvest and should be kept in the cold storage. Lack of cold store forces the grape growers to sell their products at the harvest time (maturity and peak season), and this causes an oversupply of grapes in the market led to the prices to go down.
- Economic problems of the grape growers in Parwan province do not allow them to go for new and modern technologies like converting traditional grape production to new trellised system of grape production. There are few financial institutions that provide loan to farmers. Despite that, grape growers are not interested to get loans with interest. Exporters do not lend money to grape growers due to the uncertainty on the quality of the grapes.

Here are problems that exporters face in their business

As mentioned in sub-section 4.8.11 that there is weak relationship between producers and exporters, this weak relationship is due to mistrust between the producers and exporters. Although these grape growers are organized in cooperatives and/or associations, they are not aware about benefits of working in groups. Therefore, it makes it difficult for exporters to have direct access to individual growers

Access to cold storage and cold chain is another problem that producers and exporters are facing in their business. There is no cold chain facility in the area to store table grapes or any other fresh fruit or vegetables. Therefore, producers and exporters have to supply all their produce at the same time. Over supply of produce and fruits in the market decrease the prices and producers are affected due to it. Delays during transportation increase losses. Having access to international markets aside from Pakistan and India without proper post-harvest handling, and lack of cold chain is rather difficult or is impossible. Requirements in European markets are very complicated, and need quality standard certifications that Afghan exporters do not hold.

### 5.3 Pre-harvest considerations

Traditional grape production system is most common in Parwan province. Grapes are grown in ditches (Joy) to keep the vine trees short, and to protect them from the wind. This is an old method of wind control in the region. Keeping the vine tree short also helps bunches to lie down on soil. However, these bunches get contaminated with soil which leads to damage and deterioration of quality.

The study revealed that different producers in the areas under focus grow three different varieties of grapes. The three varieties are Shundulkhani, Kishmishi, and Taifi. Shundulkhani and Kishmishi grapes are the most grown varieties among the sampled population in Bagram district and Charikar city. Growers also grow Taifi grapes in large amounts, but not like the other two kinds. Field observation shows that each variety has its own characteristics and they are shown in table 8.

**Table 8: Production, demand and specification of varieties**

Varieties	Colour	Berry size	Shelf life	Clusters/Bunches	Production %	Demand
Shundulkhani	Yellow, Yellowish	Middle and longed	Unknown	loose & tight, even	40	High
Taifi	Green, Yellowish	Big and round	Unknown	loose & tight, even	23	High
Kishmishi	Yellow, Yellowish	small and round	Unknown	Tight, uneven	37	Low

The above table shows that Afghan varieties of table grapes have the specification and quality which are demanded by consumers in the international market.

According to Crisosto and Smilanick main factors of consumer preference for table grapes are firmness of the berries, shape and bigger size of berries, color, and lack of defects like cracked berries, decays, brown stem, and sunburn damages.

Quality of table grapes to some extent relies on weather conditions. For example, in 2004 the north suffered badly because of cold weather during the growing season, leaving both low quantity and poor quality of table grapes (Lister and Brown, 2004).

Most of the respondents in the two districts mentioned that the qualities of table grapes are mainly influenced by climate conditions such as rain and high humidity afterward this speed up infection of diseases like powdery mildew and botrytis that are the two main diseases found in the vineyards of the two focus districts. Traditional use of agricultural practices and improper use of pesticides cause sunburn damage and physiological disorders in the berries that; in the later stages will deteriorate the quality of table grapes.

In order to produce disease free table grapes, farmers use two methods. 70% (21) of the respondents said that they only use chemicals to control these diseases (powdery mildew, botrytis and downy mildew), but the remaining 30% (9) of the respondents in addition to chemicals, also use mechanical controls. Grape growers buy low quality chemicals from local input shops, and due to their illiteracy they do not manage to read the label and application guideline to check the expiry date and to apply the correct amount and dosage of the pesticides to control diseases properly.

## **5.4 Harvesting**

Regular hand harvesting has many advantages like avoiding mechanical damage by careful harvest and proper handling. Hand harvest also allows the harvester to select the best clusters of table grapes in the vineyard regarding the maturity and appearance. Management of labors and pickers are the main disadvantage of this method which can be reduced by providing a short training on harvesting skills and it will be useful for preserving the quality of table grapes (Mencarelli and Bellincotro, 2005).

This study reveals that grape growers harvest 77% of table grapes and they determine harvest time by size of berries, color and taste. Family members of grower and hired labors that mostly consist of small children harvest grapes, and the most common method of harvesting is hand harvest. These labors/harvesters are not skilled enough; they do not consider maturity like color, taste, berry size and clusters during harvesting, and they harvest mixed quality of table grapes. Handling of clusters during and after harvest is done improperly which causes physical damage to the berries.

Based on the research findings and field observations made by the author simple harvesting material like knife (cutter), big baskets (Kajawa) and hand wheeler are used during harvest for table grapes. After detachment of cluster with the knife they are placed in big basket one on top of another that leads to physical damage to the berries.

According to the grape growers surveyed, their main problems during harvest are local harvesting (big shoulder baskets, knife) and packaging (plastic bags, 10.5kg & 14 kg wooden crates, cardboard boxes) materials, and unskilled harvesters and packers. They fill grapes in big shoulder bags and when it is full they bring it to a tent or in a shade for packing. Trimming is done by hand to remove the damage berries from the grape clusters. Packing is done in the vineyard by the packers employed by the exporters. These packers have no knowledge of the standard packaging, but they are experienced on fast packing with mixing different quality and grades at the same crate or box.

Most of the grape growers do not train the hired labors or harvesters that are daily-based. Providing trainings are time consuming and as well as costly to the grape growers since they

are not rewarded by buyers. Findings of the research tell that around 25% of the respondents were provided trainings on how to harvest and handle table grapes. These growers were among those producers that NGOs trained on harvesting, sorting and presenting the table grapes in the market.

## 5.5 Value addition and factors of quality deterioration

Grape growers are usually considered responsible for harvesting. After a deal is made between the grape grower and the agent of the exporter, the exporter then becomes responsible for providing labors for sorting and packaging and supplies for packaging.

According to Roots of Peace 2010, little attention is given to clipping, trimming, cleaning and presenting of table grapes in Afghanistan. Field packing is common in Afghanistan after harvest at the vineyards; over filling of boxes and crates is also one of the common practices which lead to decay, crushing and splitting of grapes.

Grapes are harvested early in the morning by the grape growers (family members, hired labors), and then brought to a collection point in the vineyard, which most of the time is a tent under a tree for sorting and packing or under shades of vine tree. Grapes are then trimmed, sorted and packaged by untrained daily-based labors hired by the exporter. Grapes are trimmed and sorted manually by hand (fingers), which is not considered to be the proper way. Sometimes only one person is responsible for all above-mentioned activities. On the other hand, since the trucks or trailers have to leave toward the final destination on the same day; packing labors are pressured to pack the harvested grapes as fast as they can (Figure 36).



**Figure 36: Trimming, sorting and packaging of table grapes by one person**

Despite the facts that export companies know about quality standards of table grapes in the international markets, but the field observation shows that their daily based hired labors in the field with having little or no idea of the international market standards, they over fill different



quality (grade) of table grapes at the same crate or box and then it is closed by putting their foot on top of it (Figure 37). This is the first step of post-harvest handling in which deterioration of quality occurs.



**Figure 37: Improper closing of crates**

The factors that influence the quality of table grapes and lead to fetch low prices or rejection at the final destination at this stage of post-harvest handling are mentioned bellow:

- Sorting grapes by unskilled labors and poor packaging materials that damage table grapes due to improper handling during transport, there is no label in the packages to recognize the supplier and to show type of variety, grade, weight and other specifications.
- Unskilled packing labors
- Mixing first grade with second and third grade qualities of table grapes by placing second or third grade quality on the bottom of the crates or boxes and first grade quality on the top
- Over filling of boxes/crates and closing the top by stepping on it causes bruising to the berries and clusters.

## **5.6 Storage**

Storage is considered as the critical phase of post-harvest handling of table grapes. For that reason, it is essential to remove the field heat from the grape fruit immediately after harvest. This helps to decrease the rate of fruit respiration and minimize the water loss from the grape fruit (Rosenstock, 2007). To obtain utmost storage life for fruits and other perishable products or to decrease losses during post-harvest practices, it is necessary to keep them at proper temperature level which is generally over chilling or freezing injury (Thompson, 2003).

Storage is the main issue of grape growers and exporters. There is an absence of cold storage facilities in the region. Storing table grapes in the cold store can maintain the quality and they can be kept for longer period of time. Absence of cold store facilities forces grape growers and

exporters to sell table grapes at the peak season. Therefore, there is an oversupply of table grapes during mid-August and September. Currently the exporters start transporting grapes to the final destinations on the same day of harvest.

During improper storage, water loss is one of the main changes that occur to the grapes. Effects of which can be noticeable in the grapes like browning of stem, firmness and turgidity loss of the berries. Adequate and ideal temperature for storing table grape is 0°C with relative humidity of 95%. In order to minimize the water loss of the stem, air circulation is essential. High investment is needed to build a high standard cold storage which is beyond the capacity of both the growers and the traders in the developing countries. There are also some simple and low cost techniques to reduce field heat from the grapes like putting grapes or other fruits in an atmosphere which is built by straw or bricks, then the walls are wetted to cool down the inside temperature of the construction (Mencarelli and Bellincotro, 2005).

According to the survey conducted, exporters do not have sufficient understanding of temperature and relative humidity and practical experience of storing table grapes. Though, they have been trained on storage methodologies. Financial issues and high investment costs of cold storages will not allow growers or exporters to have their own storages. As mentioned above, exporter can use simple techniques to build a simple storage in order to reduce the field heat as much as possible, and grapes can be stored for a short time as well.

## **5.7 Transport**

According to Kader and Rolle in 2004, it is necessary to control and manage temperature for long distance transport. Loading and unloading of grapes in cool trucks must be in a way that minimizes the physical and mechanical damage as well as to allow the air circulation to remove the heat from the product. Immediate cooling after harvest and before loading for transport is essential. Temperature should be maintained at a proper level during the transport for long distance.

All interviewed companies responded that they are responsible for transportation of table grapes. Small trucks move around in the villages to collect and transport packed grapes waiting for loading under the shade or sometimes under the sun on the roadsides. Grapes are loaded without enough care and attention to the quality. Crates are stacked on top of each other without leaving space for air circulation during transportation. By the time the truck is loaded at each vineyards and heads to Kabul, it is almost midday (Figure 38).





**Figure 38: Loading into a trailer under the sun without leaving space for air circulation**

The grapes are transported without proper care to a collection point in Kabul to be unloaded and reloaded to big trucks or trailers. Improper transportation, lack of cooling facility, and hours of unloading and loading in the sun during the hottest hours of the day (usually 35C), accelerates deterioration of quality and water loss of the stem and berries.

Different factors that affect the quality of table grapes during post-harvest handling and transportation are as follows:

- Limited procedures in order to remove heat from the produce after harvest
- Grapes are damaged during moving crates from the vineyard to the road side
- Table grapes are physically damaged during sorting and packaging
- Bumpy roads and high temperature with no protection from the sun during transporting table grapes from the vineyard to the collection point in Kabul
- Extended delays in the sun between unloading and reloading from small trucks to big trucks
- Full loading with no space for air circulation and high temperature during transportations to other countries
- Extended delays in maximum heat at the customs and Afghan-Pakistan border

## 5.7 SWOT analysis

Table grape sub-sector and export chain is briefly analyzed below:

**Table 9: SWOT analysis of table grape sub-sector**

Strengths	Weaknesses
<ul style="list-style-type: none"> <li>➤ Grape growers are organized in groups</li> <li>➤ Grape growers are producing varieties demanded by market</li> <li>➤ New technologies and support exists for the sub-sector</li> <li>➤ Normally good annual production (yield)</li> <li>➤ Exporters are eager to build relation with growers</li> <li>➤ Low labor cost and employment opportunities</li> </ul>	<ul style="list-style-type: none"> <li>➤ Though, growers are organized, but they are acting individually</li> <li>➤ No quality control system in Afghanistan</li> <li>➤ Irregular and unreliable supply of table grapes</li> <li>➤ Unskilled labors (pickers, packers)</li> <li>➤ Low quality of packaging material for export market</li> <li>➤ Improper post-harvest handling</li> <li>➤ High temperature with having no access to cold chain</li> <li>➤ Seasonal business</li> </ul>
Opportunities	Threats
<ul style="list-style-type: none"> <li>➤ Demand for table grape is high in the international markets</li> <li>➤ Support of government policies for strengthening agriculture sector</li> <li>➤ Availability of new and modern technologies for producers and exporters</li> <li>➤</li> </ul>	<ul style="list-style-type: none"> <li>➤ Security situation</li> <li>➤ Climate conditions</li> <li>➤ Political relationship/situation</li> <li>➤ Pest and disease</li> <li>➤ Competition in the international markets</li> <li>➤ Illegal charges in check points in Pakistan</li> </ul>

## **6. CONCLUSION AND RECOMMENDATION**

### **6.1 Conclusion**

The aim of the research was to explore stages where the quality of table grape is deteriorating along the export chain of Parwan table grapes. Parwan table grapes are marketed through three chains, but the export chain is considered the most important chain for Parwan table grapes. Stakeholders of this chain consist of input suppliers, grape growers, commission agents, fresh fruit export companies, commission agents, wholesalers, retailers and consumers. However, it faces a lot of challenges and barriers that lead to quality deterioration, and eventually rejection by the international markets.

Inconsistent production level, limited growers' unions, and mistrust among the key stakeholders affect the chain negatively. On the other hand, poor post-harvest handling, lack of cold storages, and poor transportation are the constraints of table grapes export chain. Additionally, there are smaller chains at the local and domestic levels.

Agricultural practices such as pruning, fertility, integrated pest management, and harvesting are the most considerable factors at production level that affect the quality of table grapes on export level. Plowing, lime sulfur, fertility management, irrigation, green pruning are also considered factors of table grape quality. Low literacy levels, use traditional methods of agricultural practices and as well as low quality of agricultural inputs in local markets are other factors of low quality grape production.

There are demand for Afghan table grape varieties in the international markets, it is concluded that Afghan table grapes varieties meet the requirements of international markets. Quality parameters in the international markets are firmness of berries, big and medium size, well shaped bunches, yellow, yellowish, green colors and free from decays, but there are other factors and causes that influence quality of table grapes during the chain.

It is concluded that harvesting time (determined by color, taste and size) and processing are important parts of pre and post-harvest handling in export chain; therefore this issue has to be dealt with in order to improve the quality of table grapes in Afghanistan for export purposes. Processing involves a series of activities such as trimming, sorting, grading, and packaging according to consumer market requirements. Improper handling and manipulation of unskilled labors at this stage are the causes of physical damage and losses to the grapes and fetching low price in the international markets.

High temperature is affecting quality of table grapes after harvest and causes water loss and stem browning; therefore, reducing heat from the product immediately after harvest and storing it in an appropriate low level of temperature and high RH can maintain and preserve the quality for longer time. Having no access to cold store is a challenge that grape growers and exporters are facing and it forces them to sell their produce for a lower price during the peak season.

As mentioned above, maintaining appropriate levels of temperature is necessary for the quality of grapes. A lot of important factors such as proper loading and unloading, air circulation, and maintaining proper temperature during transportation is not taken into consideration. Furthermore, extended delays at customs and Afghan-Pakistan border in severe heat are other causes of poor quality and losses of table grapes that are exported to other countries.

## 6.2 Recommendations

On the basis of conclusion discussed in previous section (6.1), the following suggestions and recommendations are made to improve and maintain quality of table grapes to be acceptable at the arrival for the international markets.

### **Recommendation to farmers and farmer's organizations:**

#### **Pre-harvest management**

Varieties, such as Kishmishi and Shundulkhani often produce more clusters than the vine can properly mature. Simply remove some of them. This allows the foodstuff produced by the leaves to better nourish the remaining clusters. After the berries have set, remove clusters that are undersized, oversized, or misshapen. This is probably the most important step in improving quality

Netting and bagging grape clusters are necessary in order to protect grapes from bird and wasp/bee damages. In Afghanistan, the vines are planted in such a way in ditches that makes it easier to bag the clusters rather than netting which requires more effort and capital. Therefore, the grape growers would be better off bagging their grapes to avoid birds damaging them.

Producer's organizations (PO) can play an increasing role in supporting commercial agricultural development among smallholder farmers in Parwan province. As NGOs, donors and government encourage scaling up POs' activities and membership, farmers are still unwilling to join them. With limited resources and facing a very challenging environment, these POs generally need external support for start-up. For getting the balance right between external and internal resources, between accountability and leadership, between flexible and effective structures, and gaining farmers' trust means that POs need to work very hard.

In order for producer's organizations to be successful and build reputation among farmers, they have to set their goals to satisfy current and potential members. Their main goals have to be:

- Employ experienced / skilled personnel
- Act as Liaison between farmers, government, and other supporters
- Provide easy access to commercial services such as subsidies on agricultural inputs and exporters
- Promote low transaction costs
- Improve information flow
- Increase bargaining power
- Provide cost effective market entry
- Arrange practical trainings on new agricultural techniques and applications of agricultural inputs through third party supporters
- Facilitate third party loans for farmers

In order to deal with over supply of table grapes during peak seasons and control dramatic price drops, producer's organizations need to build straw huts in each village to store table grapes for

a short period of time. Straw huts cost less to build and easier to maintain. On the other hand, for better harvest management, POs in the long run can also get involved in post-harvest processing i-e: harvesting, sorting, grading, and packaging for exporters in a professional manner.

### **Recommendation to export companies**

Since export companies are responsible for processing and transporting immediately after harvest, the following recommendations are given here for better presenting, handling and transporting of table grapes.

Shatter is mainly caused due to maturity, improper handling during field packing, and as well as on the way to the final consumer market. Controlling pack depth and fruit packing density, using cluster bagging, gentle handling and maintaining recommended temperature and relative humidity can reduce shatter incidence.

Proper and careful harvesting is an important step in maintaining quality of table grapes. Therefore, it is recommended that exporters take the responsibility of harvesting. Careful harvesting by the exporter can help maintain quality, and on the other hand makes the produce more acceptable at the consumer markets. To avoid water loss at this stage, even though very basic and traditional, the following actions can protect grapes:

- Harvest early in the morning,
- Stack the pallets in the shade,
- Transport via covered trucks

Since the shipping container is the unit to transfer of grapes from the point of production to the point of sale or consumer market, it must be designed and used in such a way to protect individual clusters. There is no big cost of investment to it since the harvest and sorting activities are mostly performed in the vineyard in the field.

The following points must strictly be taken into consideration for packaging of grapes:

- Clusters must be cushioned against impact through immobilizing within the container.
- The walls of the container should be higher than the clusters. In order to protect berries from physical damage and compression, it is extremely important to avoid over-filling.
- Different markets have different packaging standards. For example some may require each cluster to be individually wrapped. Therefore, it is important to take buyers' requirements into consideration during packaging.
- Label is an effective marketing tool. It is important for exporters to consider labeling containers. The label on the container should contain producer brand name, type of grape, production area, etc. The label should be in native language of the receiving country.

Meeting quality and packaging standards of international market can bring higher returns to the exporters. Export companies can coordinate with producer's organizations and NGOs such as SAB to arrange trainings for their workers. The recommended contents of the trainings would be knowledge of international standards, and practical skill building during harvesting, sorting, packaging and handling of table grapes.

Investment in standard cold storages and their maintenance becomes very costly for the exporters. The best possible option would be the use of refrigerated transportation facilities. Though the cost of refrigerated trucks can be higher than the normal, but the quality of table grapes is maintained better on the way to final destination, which can bring higher returns.

### **Recommendation to supporters (NGOs)**

Since Solidarity Afghan Belgium is involved with grape sub-sector and is providing technical support to the growers through their organizations in order to increase the production, following recommendations are given to SAB to intervene in export chain of Parwan table grapes.

- In a supporting role, SAB work with both exporters and POs to build better relationship and coordination among chain actors of Parwan table grapes.
- Facilitate communication between producers and exporters, for instance time of delivery, quality and quantity needed by the customer.
- Support POs with external market affairs (institutions) to improve quality grading, negotiate transparent pricing and payments to farmer, and delivery options.
- Support of SAB to POs should be long term, and should help POs build their capacity in organizational and financial management and transparent processes.
- Provide practical field days for members of POs

### **Recommendations to Government**

The following are some recommendations for the governmental entities to:

- Provide and facilitate capacity building of extension workers
- Help exporters to find alternative markets
- Facilitate customs and border relations
- Facilitate business relationship with Pakistan and other countries
- Establish knowledge-management facility, that will be a repository of agriculture data, market information and market investigations
- Regulate quality standards

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# ANNEXES

## Annex 1: Questionnaire for producers

### Questionnaire for Producers

The interview will start with open questions to ease and get an understanding of his thinking, the interviewer will ask questions according to the pre structured questionnaire and takes note as the interviewee explains.

#### General Information

Interview date:     /     /     Interviewer: \_\_\_\_\_ Signature \_\_\_\_\_

Interviewee: \_\_\_\_\_ District: \_\_\_\_\_ Village: \_\_\_\_\_

Contact #: \_\_\_\_\_ Age: \_\_\_\_\_

#### Education level:

a) University                      b) High school                      c) Grade 9<sup>th</sup>                      d) grade 6<sup>th</sup>                      e) Illiterate

**What is your land holding size of vineyard in Jeribs? \_\_\_\_\_**

#### Which Varieties of table grapes do you grow?

a) Shundulkhani                      b) Taifi                      c) Kishmishi                      d) Hossaini                      e) others

#### How much is the yield per Jerib?

a) 500-999kg                      b) 1000-1499kg                      c) 1500 – 1999kg

#### What precautionary measure do you take to ensure the quality of grapes?

a) Pruning                      b) Lime sulfur                      c) Plowing                      d) Fertilizer  
e) Irrigation                      f) green Pruning                      g) Sulfur (powder)                      h) All

#### What kind of agriculture practices do you use?

a) Traditional                      b) Mechanized technology

#### What influences the quality of table grapes during production?

a) Climate conditions                      b) Pest and Diseases                      c) both

#### Which pest and disease do you face in your vineyard?

a) Powdery mildew                      b) anthracnose                      c) Downy mildew                      d) all

#### How do you control Pest and diseases?

a) Mechanically                      b) By using chemicals                      c) both

#### Where do you buy your inputs?

- a) Kabul                      b) Charikar                      c) Qarabagh                      d) others

**Are there any extension services in the regions?**

- a) Yes                      b) No

**Who is providing extension services in the district?**

- a) Government                      b) NGOs                      c) No one

**What kind of advice and services do they provide?**

- a) Technical information                      b) Marketing information                      c) others

**When do you sell your product?**

- a) before harvest                      b) during harvest

**Who buys the product from you?**

- a) Local traders                      b) Regional traders                      c) agents of exporters                      d) others

**Do you harvest grapes?**

- a) Yes                      b) No

**How do you determine harvest tie (maturity) of grapes?**

- a) by color                      b) by size                      c) by sugar level                      d) a,b                      e)all

**What factors do you consider while harvesting grapes?**

- a) Standard harvesting materials                      b) Standard Packaging  
c) Both a & b                      d) simple harvesting and packaging materials

**When do you harvest grapes?**

- a) Early in the morning                      b) In the afternoon                      c) late afternoon

**What are the problems during harvesting?**

- a) Unavailability of harvesting materials                      b) inexperienced pickers and packers  
c) Both

**Do you provide training to your harvesters and packers?**

- a) Yes                      b) No

**If yes, what kind of training?**

- a) Harvesting techniques                      b) Sorting & grading                      c) standard packaging and packing  
d) All

**If no, Why not?**

- a) It is costly                      b) There is not training facility

**What kind of activities you do for creating added value?**

- a) Sorting                      b) Grading                      c) Packing                      d) Cooling and Storing  
e) Others                      f) all

**How do you communicate with the buyers?**

- a) Meet them in Kabul fruit market                      b) By phone                      c) Agents                      d) others

**Where do you get market information (Quality standards, prices, demands)?**

- a) Traders                      b) Other producers                      c) Associations                      d) Kabul fruit market

**What kind of grape quality is preferred in the international market?**

- a) Big berries                      b) well shaped clusters                      c) Free of decays and damages                      d) All

**What are your main problems? Rank**

- a) No access to international markets                      b) No cold chain  
c) No standard agriculture materials                      d) weak economy                      e) all

## Annex 2: Checklist for exporters

### Checklist for grape Exporters

*The interview will start with open questions to ease and get an understanding of his thinking, the interviewer will ask questions according to the semi structured questionnaire and check list and takes notes as the interviewee explains.*

#### I. General Information:

##### 1. Information:

Interview Date:        /        /        Interviewer:        Signature:       

Name of Interviewee:        Company:       

Province:        Contact #:       

##### 2. Education Level:

- a) University      b) High school      c) Up to grade 9<sup>th</sup>      d) Up to grade 6<sup>th</sup>  
e) Illiterate

#### II. Purchasing

3. How many active exporters are available for Parwan table grapes?

4. Where do you export table grapes?

5. Which varieties do you deal with?

- a)        b)        c)         
d)

How much do you export per variety per season?        kg.

6. From whom do you buy table grapes?

- a)        b)        c)

7. How do you buy table grapes?

8. Which criteria or characteristics do you consider while buying table grapes for export market?

9. How do you fix the price with grape suppliers?

#### III. Harvesting & Packaging

10. Who does the harvest?

11. How grape is harvested?

12. What factors do you consider while harvesting table grapes?



28. How much loss do you have in your business and at which step?
29. What do you do with the losses?
30. Explain the factors influencing the quality of table grapes during transport?
31. What are the external factors affecting your business and marketing grapes?
32. What are your main problems?
33. Additional comments

## **Annex 3: Check list for producer's organizations**

### **Check list for producer's organizations**

1. How table grape chain is organized in Parwan?
2. Who are the key stakeholders of table grape chain?
3. What are the external factors affecting grape chain?
4. What are the main problems in the export chain?

## **Annex 4: Check list for extension workers**

### **Check list for extension workers**

#### **1. Respondent identification**

Name: \_\_\_\_\_ Department: \_\_\_\_\_

Qualification: \_\_\_\_\_ Telephone number: \_\_\_\_\_

Email: \_\_\_\_\_

#### **2. Services to the farmers**

- a) Do you visit the communities/farmers?
- b) How often do you visit them?
- c) What type of services do you generally provide when you visit farmers?
- d) What kind of services/supplies do you provide related to post-harvest practices?
- e) What are the problems you think as an extension worker that farmers have in regards to post-harvest processes?
- f) What are the problems you feel you have as an extension worker?

#### **3. Services to the traders/exporters**

- a) Do you visit traders?

- b) How often do you visit them?
- c) What type of services do you generally provide when you visit them?
- d) What are the problems you think as an extension worker that the traders have in regards to post-harvest handling?

## Annex 5: Cost calculations

Cost calculations of table grapes in Afs/kg					
Varieties	Farm gate price	Other costs	Total cost	Revenue	Net profit
Kishmishi	15.2	14.12	29.32	33	3.68
Shundulkhani	18.2	16.82	35.02	40	4.98
Taifi	18.6	16.82	35.42	40	4.58

## Annex: Photographs

